1968 FIELD CROP RECOMMENDATIONS

(for chemical weed control see publication 75)

ONTARIO DEPARTMENT OF AGRICULTURE AND FOOD

PARLIAMENT BUILDINGS, TORONTO

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DEPUTY MINISTER

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MINISTER

Space limitations in this booklet restrict the amount of detail which can be included in each recommendation. Where commercial products are recommended, this detail is provided, by law, on the container label. Read and follow the directions, conditions, and limitations described on such labels. This is the only way to make effective, safe use of such products (see also pages 40 and 41). Additional information on other practices recommended here can be obtained from the local office of the Ontario Department of Agriculture and Food. See page 44 for a listing of the locations.

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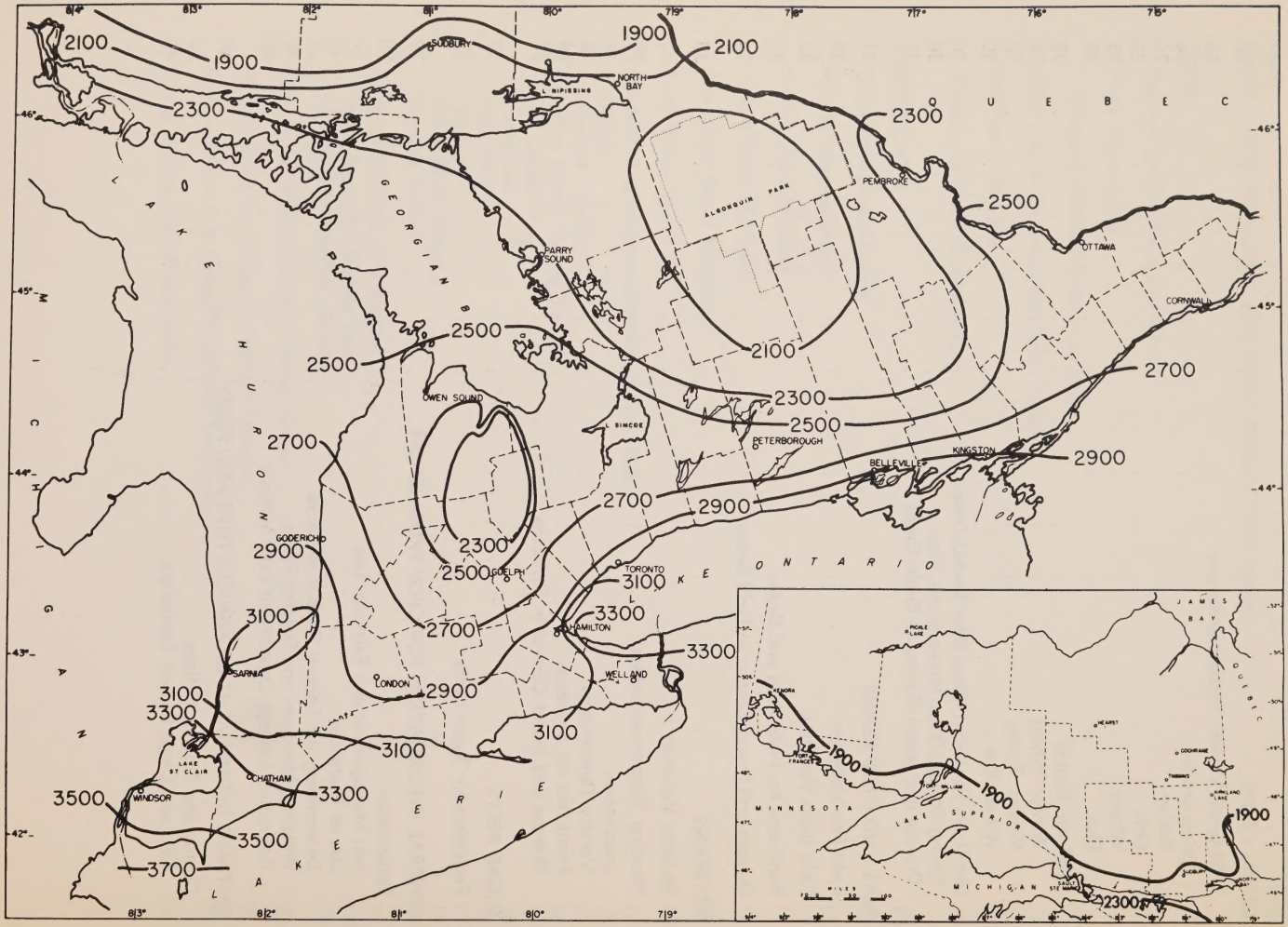


HEAT UNITS AVAILABLE FOR CORN PRODUCTION

Zero or Limited Tillage of Corn

Complete chemical weed control in corn has already greatly reduced the amount of tillage needed for corn production. Row cultivation has been virtually eliminated and seedbed preparation has been reduced to plowing and a once-over-operation with diskharrows, cultivators and possibly a finishing harrow. The question now arises, can tillage be further reduced or can it be eliminated entirely?

At present, zero tillage corn planters are available commercially. This one fact alone compels us to bring to the attention of the Ontario farmers the pros and cons of using this equipment on their farms. It should also be stated that such equipment has been tested widely enough to inform us about their reliability and their limitations. The most widely tested machine is the No-Til corn planter pictured in the accompanying photos. It can be stated that this machine is neither a toy nor a gimmick; it will plant corn in a wide variety of no tillage or limited tillage situations. It does not require high power, nor is it a great deal more expensive than standard corn planters. It can also be used for planting corn with normal seedbed preparation.

ZERO VS LIMITED TILLAGE

Zero tillage means exactly what it says. Corn is planted on a chemically destroyed sod or corn stalks or stubble field without plowing or cultivating. Limited tillage means using some form of primary fall tillage such as heavy duty cultivator or double offset heavy disk without any spring tillage. The argument over which is better has not been resolved. Generally, yield results are the same, but on some situations limited tillage has been better. The odds for success would seem to be weighted slightly towards limited tillage.

There are several possible advantages for limited tillage: (1) remove wheel tracks from harvest operations, etc (2) improve water infiltration (3) incorporate bulk fertilizer applications.

APPLYING FERTILIZER

Neither phosphorous nor potash moves in the soil. Thus any surface applications for corn tend to be badly placed relative to plant uptake. Applications with the corn planter band place fertilizer but are restrictive in the quantity that can be used. This objection can be partly overcome by using limited tillage.

No problem with nitrogen should be encountered, because this nutrient moves within the soil. Nitrogen also can be injected as Aqua or Anhydrous.

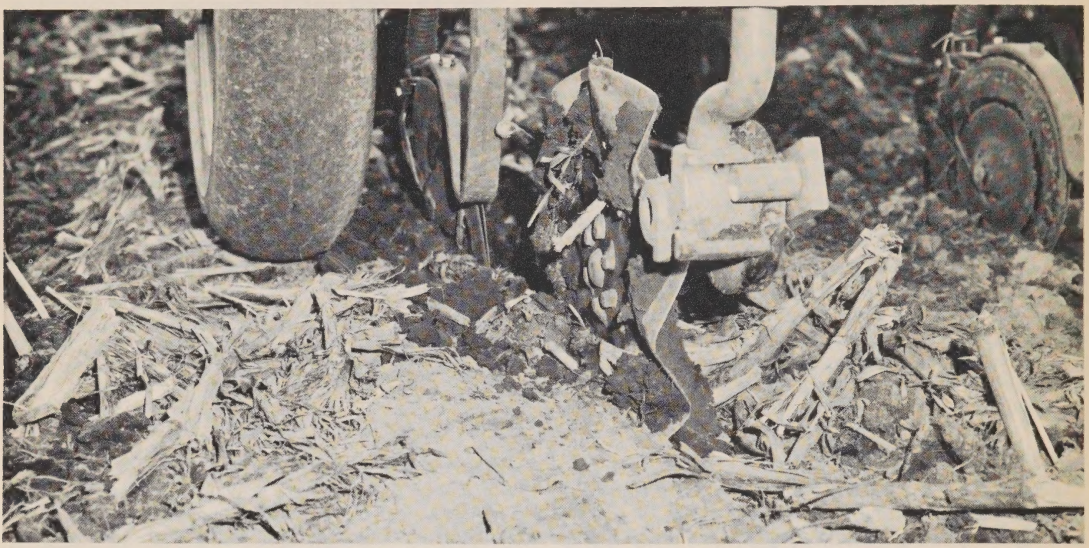
CORN STALK MANAGEMENT

With zero tillage corn stalks do not need to be chopped. With limited tillage using a heavy duty disk no chopping is required, but if a heavy duty cultivator is used, a chopper is a necessity. Generally corn stalks have virtually disappeared by next harvest time, and no trash problem is anticipated.

No tillage planters seed corn through corn stalks on a production basis. One of several fields is shown here at planting time 1967.

WHAT CAN YOU EXPECT FROM "O" OR LIMITED TILLAGE?

Expect a slightly slower start and slightly shorter plants. This dictates a slight increase in plant populations. Yields will in most cases (on specified soil and fertility conditions) be equal to or slightly less than normal tillage. You can plant most fields sooner and certainly you will be able to plant a great deal more corn with less help and closer to an optimum planting date. Such a system seems particularly well suited to well drained, stable soil conditions with a built-in high fertility level. As well, it seems to fit into the usual Ontario livestock situation where labor at planting time is always in short supply.



The No-Til coulter cuts through trash and tills a narrow band for seed and fertilizer placement.

ZERO OR LIMITED TILLAGE?

The research work that has been done, while by no means completed, points to several conclusions. (1) Some soils are more suited for zero or limited tillage than others. Generally these soils are the well drained, stable soils. Heavy intractable clays and clay loams and poorly drained, soils are suspect. (2) It is easier to start from a chemically destroyed sod than any other situation. (3) A mulch of straw or corn stover is better than a bare or essentially bare field. (4) High fertility is a prerequisite. The interpretation here is that zero or limited tillage can best be started on farms which have had a regular and consistent fertility build-up. (5) Extra nitrogen is required (at least in the first and possibly in second year). This is calculated to be approximately 20 to 40 lbs of nitrogen beyond normal requirement (e.g. 100 lbs aeroprills); (6) Weed control must be absolute (see Ontario Department of Agriculture and Food Publication 75). (7) Plants growing on zero or limited tillage tend to be slightly smaller and to start off more slowly. (8) A higher seeding rate is needed (2 to 4,000 seeds per acre extra). (9) "No tillage" seems to improve in the second and subsequent years.

Plant Populations

In standard row widths of 36, 38, and 40 inches, a population of 18,000 plants per acre is recommended. It probably should be reduced somewhat in areas of frequent drought, where fertility is low, or under late-planting conditions. A higher population is probably warranted where maximum yield is being sought, assuming moisture is adequate, fertility is high, and planting is early.

Inches Between Seeds to Achieve Specified Populations

Expected Plants per Acre	Required Seed per Acre (assume 85% stand)	Row Width					
		28	30	32	36	38	40
18,000	21,200				8.2	7.8	7.4
20,000	23,500				7.4	7.0	6.7
22,000	25,900		8.1	7.6	6.7	6.4	6.1
24,000	27,600	8.1	7.6	7.1			

Choosing Hybrids for Grain or Silage

Locate your farm on the map on page 6 and estimate the heat unit rating for the farm. If you plant corn before May 15th, select the hybrid from among those on the following list having the same as or a lower heating unit rating than your farm. If you plant later than May 15th, select from among those hybrids having at least 100 heat units less than the rating for your farm.

1968 List of Recommended Corn Hybrids

(Sx) designates single crosses

This list of hybrids indicates the number of heat units required for their production. They are listed in relative order from early to late. The heat unit rating applies to the hybrids above and below as well as the hybrid opposite the specific rating.

Heat Unit Rating	Hybrid
	Warwick SL 209 (Sx)
	Pride 116
2600	United 108 (Sx)
	Warwick 261
	Pride R118
	Dekalb XL 301
	Pride R100 (Sx)
	Pioneer 3889
	Seneca XX155
	United 3H 11
	Warwick 214
	United 7
	Funks G43
	Haapala 305
2700	Asgrow A28
	Pride 5
	Weathermaster WM 50
	Pioneer 3872
	PAG Sx 47
	United 118 (Sx)
	United 118A
	Warwick 263
	PAG Sx 48 (Sx)
	Pioneer 3956 (Sx)
	Dekalb XL 304
	United 127 A (Sx)
2800	Pride 137
	PAG 38
	Dekalb 45
	Pride 127
	PAG 41
	Warwick 291
	Pioneer 388
	NK Px 446

Heat Unit Rating	Hybrid
	Pioneer 3849
	Pioneer 3675
	Co-op C110
2900	Funks G4110 (Sx)
	Seneca 285
	Seneca 320
	United 126 (Sx)
	Haapala 360B
	Jacques 951 J
	Pride 305
	Warwick 316
	Warwick 401
	Warwick SL 514
	Pioneer 3911 (Sx)
3000	Pioneer 385
	Pioneer 3676
	Pride R200 (Sx)
	Seneca 315
	Seneca 318
	Funks G4287
	Warwick SL415 (Sx)
	NK Px 480
3100	Asgrow ATC 45
	Warwick 317
	Co-op S327 (Sx)
	Dekalb XL 315
	Pride 432
	Belle River 295
	Pioneer 385A
3200	Pioneer 3658
	Pioneer 3775 (Sx)
	PAG 45
	Haapala H 81
	Pioneer 368A
	Pioneer 3773 (Sx)
	Pioneer 3622

Heat Unit Rating	Hybrid
	Pride 495
	Funks G17A
	Seneca 350
3300	NK KE 497
	NK Px 527
	Belle River 350
	Dekalb XL 316
	Dekalb XL 325
	Todd 228
	PAG Sx 49 (Sx)
	Pioneer 371
	Pride R407
	Co-op H 350
	Dekalb XL 45 (Sx)
	Dekalb XT 218
	Jacques 1105 J
	PAG Sx66 (Sx)
3400	Todd M 60
	Todd M 55
	Warwick SL 615
	Belle River 401
	Funks G4390
	United IXL 5
	Warwick T62
	Co-op S345 (Sx)
	Co-op S349 (Sx)
	Haapala Sx 621 (Sx)
	Pride R450
3500	PAG Sx 52 (Sx)
	PAG Sx 36 (Sx)
	NK KM 567
	Funks G4384 (Sx)
	Funks G4333 (Sx)
	United IXL 6
	United 32 A
	Belle River 400

Fertilizers for Corn

Fertilizer needs of the corn crop should be determined from a soil test. The following general fertilizer recommendations should be followed only when a soil test report is not available.

► On sandy or loamy soils use 100 lbs N, 60 lbs P_2O_5 and 60 lbs K_2O per acre, e.g. 5-20-20 (a 1-4-4 ratio) at 300 pounds per acre, plus 85 pounds additional N.

► On clay soils use 100 lbs N, 60 lbs P_2O_5 and 30 lbs K_2O per acre, e.g. 5-20-10 (a 1-4-2 ratio) at 300 pounds per acre, plus 85 pounds additional N.

► If well-manured, reduce the total fertilizer application by one-quarter. Following a legume sod, only the nitrogen can be reduced to a total of 50 pounds per acre. If manured and following a legume sod, additional N may not be required.

Methods of Fertilizer Application

► A portion of the nitrogen and phosphorus should be applied as a starter at planting time in a band two inches to the side and two inches below the seed. The potassium and the remainder of the phosphate may be banded or broadcast and plowed down.

Small amounts of fertilizer applied with the seed have given yield increases of approximately five bushels per acre. For specific recommendations concerning this method of fertilizer application contact your local Agricultural Representative.

The additional nitrogen required may be applied as a preplant application (plowed down, injected, or worked in) or as a side-dress application. If side-dressing, apply before the corn is twelve inches high. Experiments indicate spring applied nitrogen is more efficient than applications the preceding fall. Therefore, spring applications are recommended.

Where equipment for applying additional nitrogen is not available, a fertilizer of a 2-1-1 ratio may be used alone as the sole source of nitrogen, phosphorus, and potassium. For example, 16-8-8 may be used at 600 pounds per acre, provided not more than one-half is banded with the planter.

Disease and Insect Control in Corn

(See also pages 40 to 41)

SEED TREATMENT

► **SEED MAGGOTS** and **WIREWORMS.** Commercial corn seed sold in Ontario is treated with a fungicide to control seed-decay organisms. Some seed is also treated to control stored-seed insects. **All seed should be further treated** with diazinon for control of **SEED MAGGOTS** and with lindane for protection from **WIREWORMS.** Planting box formulations of the combination seed treatment (diazinon-lindane) should be used every year because maggots are usually an annual pest and the kill of wireworms seldom is high.

Treat seed — never earlier than three months before planting — with the combination treatment. Follow the directions stated on the container with care. Mixing in the planting box must be thorough or germination will be reduced and insect control will be poor. For your protection while mixing, use rubber gloves or a wooden paddle and avoid breathing dust stirred up as the mixing is in progress.

SOIL TREATMENT

► **CORN ROOTWORM.** Crop rotation is the easiest and recommended way to control rootworm, which is specific to corn.

Where corn is grown continuously, rootworms tend to increase in numbers. This causes "goose-necking" and lodging which, if severe, hamper picking operations and reduce yield. If stalk rot also is present, lodging may become a serious problem. Treatments can be applied to reduce lodging but you should make certain that a control is necessary. Examine the roots of "goose-necked" plants. If the root system is greatly reduced apply **any one** of the following treatments at planting time at the per-acre rates given. All treatments are granular formulations applied in a 3- to 6-inch band placed ½ to 1 inch above the seed and in front of the press wheel but not in contact with the seed. DO NOT USE BROADCAST TREATMENTS. Use the lower rates on light soils:

diazinon 5% granular, 15 to 20 lbs OR 14% granular, 7 lbs
*phorate (Thimet) 10% granular, 5 to 10 lbs
*disulfoton (Di-syston) 10% granular, 5 to 10 lbs.

Where corn will be grown continously for a number of years, aldrin, 20% granular, 2½ to 5 lbs; aldrin 5% granular, 10 to 20 lbs **OR** chlordane 25% granular, 4 to 8 lbs **OR** heptachlor 5% granular, 10 to 20 lbs may be used but with the following reservations: root crops such as potatoes, rutabagas, or sugar beets for livestock feed cannot be grown on land that has been treated with these materials; dairy cows should not be permitted to graze in treated corn fields after harvest. You should consider these limitations carefully before using these insecticides for rootworm control.

Pollination sometimes is reduced by rootworm adults feeding on silks. If these greenish beetles are numerous when the silks appear, apply carbaryl (Sevin) 80% or 85% wettable powder, 1 to 1¼ lbs **OR** 50% wettable powder, 2 lbs, on the ears, especially the silks.

FOLIAGE TREATMENT

Treat foliage to be used for feed or bedding with no other insecticide than carbaryl (Sevin). Do not use for feed or bedding, plant parts treated with insecticides other than carbaryl (Sevin). If airplane application is to be made, see precautions on page 41.

► If **CUTWORMS** attack the foliage of corn plants, spray the seedlings and a 10-inch band in the row with carbaryl, using at least 20 to 25 gallons of water per acre.

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* *These materials are deadly poisonous to the operator. Handle with care. Follow all directions stated on the label.*

NOTE: If cutworms attack beneath the soil surface, treat the rows using insecticide in a minimum of 50 gallons water per acre.

Spray: carbaryl (Sevin) 50% wettable, 4 lbs; 80 to 85% wettable, 2½ lbs.

► **ARMYWORM.** Because grassy and weedy corn is attractive to armyworm moths for egg-laying, eliminate grasses and weeds from the corn crop. (See Ontario Department of Agriculture and Food Publication 75, Guide to Chemical Weed Control). The result will be less armyworm damage to corn.

If armyworms move into corn fields, spray the border rows and adjacent cereals, pasture, or hay crops with carbaryl (Sevin), malathion, methoxychlor, or parathion or treat with poison bait (see page 32 under "Grain Crops").

If you propose to spray an in-bloom forage crop, first read the warning about bees on page 40

► **CORN EARWORM, CORN BORER, CORN LEAF APHID, CHINCH BUG.** These insects seldom cause enough damage to warrant control. For further information ask your Agricultural Representative or Soils and Crops Specialist.

► **STALK ROT.** Because stalk rot is a mature plant disease and becomes more of a problem the longer the crop is left in the field, harvest as early as possible. Grow hybrids with low stalk breakage counts, as listed in the 1968 Ontario Hybrid Corn Performance Trials. Copies are available from your County Agricultural Representative.

Increases in grain corn acreage force consideration of on farm grain handling systems. In cash crop situations driers and dry handling will be significant. On farms where corn is being grown to feed at home, high moisture storage in silos commonly is a most practical alternative. Volume of corn to be handled and stored governs the extent of facilities for individual situations. The large investments generally involved dictate a policy of planning ahead before any construction is begun. A most common problem has been failure to plan far enough into the future for the flexibility and expandability likely to be needed.

Choosing a Seed Mixture

Success with a seed mixture depends upon the correct selection of the legume and the grass components to suit the conditions under which the mixture will be grown. As mixtures containing one legume and one grass are more productive over a longer period of time than complex mixtures, the simple mixtures should be used.

The selection begins with the choice of a legume to suit the intended use, soil drainage conditions, the duration of stand desired, and the management to be imposed on it. This selection can be made by reading the information provided below for mixtures based on each legume.

Each legume is included as a basic ingredient in a number of seed mixtures for different purposes. The use recommendation column accompanying each mixture on pages 13 to 16 provides the key to choice of a specific mixture once the legume base has been established.

ALFALFA-BASED MIXTURES are suited to stored-feed and green feeding programs. Because of the bloat hazard, alfalfa is recommended for pasture only when the grass included is a good producer of aftermath (e.g. orchard). Alfalfa mixtures produce more hay, silage, or green chop than any other mixtures. They produce best under good drainage and a pH of 6.2 or more.

STANDARD TYPES of alfalfa give high production on both well-drained and imperfectly drained land. Generally, these types should form the major portion of the alfalfa acreage on a farm because of their winterhardiness and persistence. Some have resistance to bacterial wilt, the soil-borne disease that causes stands to thin out in the second and subsequent harvest years.

It is accepted that standard alfalfas can be made to produce for 3 to 6 years under good management on well-drained soils. Under imperfect drainage, they will persist up to three years under good management.

Standard alfalfa varieties are later-maturing than Flemish types. They are preferred for all areas where winterkilling is a problem.

FLEMISH TYPES of alfalfa grow more rapidly, mature earlier and produce more aftermath than standard types and are suited for early harvest as stored feed or green chop. They should be used where 2- to 3-year stands are desired on well-drained soils. While they normally constitute a small part of the alfalfa acreage on a farm, special and intensive programs could use these types for a major portion of the alfalfa acreage. The ability of Flemish types to develop fast and provide more and earlier aftermath should be exploited.

TREFOIL-BASED MIXTURES are suited to stored feed and green feeding. The no-bloat feature makes trefoil highly recommended for pasture. Trefoil-based mixtures should be used for stands of three years or more duration and whenever alfalfa does not do well because of too wet conditions. Stands of trefoil have been known to be productive for 20 years in Ontario. Under high fertility and well-drained conditions trefoil will be shorter and produce somewhat less total forage than alfalfa. It is not suited to 1- or 2-year stands because of its low seedling and early growth vigor.

LADINO CLOVER MIXTURES perform best as pastures, particularly in areas where moisture is plentiful and winterkilling is not a problem. They are difficult to cure as hay but make excellent silage. Orchardgrass performs well in combination with ladino, making an early-maturing mixture. Ladino pasture presents a bloat hazard unless it is combined with grasses (e.g. orchardgrass) that are productive at the same time (during midsummer).

RED-CLOVER-BASED MIXTURES are less popular today than in previous years because they produce for only short terms. For stored feed, red clover produces well for one year and sometimes slightly in the second harvest year. Early disappearance of red clover leaves grass alone to produce. Do not use in pasture mixtures.

PURE GRASS STANDS OR MIXTURES OF GRASSES perform well where legumes cannot be included because of poor drainage or extremely acid conditions. They require large quantities of nitrogen to provide high yields. Split applications of nitrogen are preferred, e.g. one application after each harvest.

Alfalfa-Based Mixtures

MANAGEMENT

1. All varieties of alfalfa should be harvested at very first flower stage of maturity to obtain high quality, high yield, and good persistence.

2. Flemish types will be harvested on an earlier date than standard-type alfalfas because they are earlier-maturing.

3. Flemish types harvested at the recommended stage give rapid aftermath recovery and higher aftermath yields than the standard types.

4. All alfalfas should have a period in early autumn to build up adequate food reserves in the roots to help them survive the following winter. This means no harvest or grazing during a 4- to 6-week period (e.g. September).

5. Close grazing of alfalfa must be avoided on all stands expected to produce the following year.

6. Maintenance of stand and high levels of production demand high levels of phosphorus and potash.

Mixture Number	Components	Seed Rate	Use Recommendation
STORED FEED (high dry matter silage or hay) and GREEN CHOP			
42	Alfalfa alone	12	(Up to four years.) Special seedings for high protein feed grown under high fertility, weed-free conditions (see Publication 75), harvested under timely management and stored as high dry matter silage, dehydrated meal, or well-cured hay. Use on uniform fields where alfalfa is known to do well. Should produce well in seeding year if direct-seeded under good management.
2	Alfalfa Bromegrass	10 8	(Up to four years.) For farms where good brome stands are obtained and good fertility and management practices are used. Suitable for dry soils. More suitable than mixture 41 for most farms having more than 3,100 heat units because brome will establish, survive, and produce better than timothy under drier conditions. Use Saratoga brome. For early mixtures use Flemish alfalfa. For medium-maturing mixtures use standard alfalfa.
41	Alfalfa Timothy	10 6	(Up to four years.) For fields where aftermath not required as pasture but where hay yield and quality are main considerations. Use this high-producing mixture as one of a series to diversify the maturity date of mixtures on the farm.
44	Alfalfa Timothy Bromegrass	10 4 6	(Up to four years.) For use on farms where bromegrass is being seeded for the first time. Use standard-type alfalfa.
43	Alfalfa Orchard	10 6	(Up to three years.) For use on part of acreage where cutting and/or grazing can be matched with maturity of the varieties used. This early-maturing mixture demands early cutting for high digestibility and to insure fast recovery and high aftermath yields. For best results use Flemish varieties only. Where ladino is adapted, ½ lb ladino can be added.
PASTURE			
35	Alfalfa Ladino Timothy Bromegrass	8 2 4 8	Should produce from 4 to 6 years. For part of pasture acreage and for hay pasture. Use in combination with mixtures containing orchard to help spread pasture production period. Preferred over mixtures 10 and 31 for Northern Ontario. In Northern Ontario replace ladino with 2 lbs white dutch clover.

Mixture Number	Components	Seed Rate	Use Recommendation
11	Alfalfa Ladino Orchard Bromegrass	8 2 3 8	Should produce from 4 to 6 years. Use in conjunction with mixture 35 to spread pasture production. Alfalfa, orchard, and brome give good production under dry conditions.
10	Alfalfa Ladino Orchard	8 2 8	Often productive for 4 to 6 years. High fertility and good management are necessary for top production. Alfalfa is included as insurance against dry conditions.

Trefoil-Based Mixtures

MANAGEMENT

1. Elimination of nurse (companion) crops and weeds during the seedling year is reflected in vigorous seedlings, provided phosphorus and potash are adequate.
2. Vigorous seedlings produce highest yields in the first crop year.
3. Harvest at early flower results in forage quality second to none.
4. Productive stands require annual fall applications of phosphorus and potash.
5. Protection from both close grazing and harvest in September is essential to good production in the following year.

RECOMMENDATIONS

Mixture Number	Components	Seed Rate	
STORED FEED (high dry matter silage or hay) or GREEN CHOP or PASTURE			
46	Trefoil alone	10	Special seedings for: (1) high energy and/or protein feed grown under high fertility, weed-free conditions (see Publication 75), harvested under timely management and stored as high dry matter silage, or well-cured hay. Use trefoil where long-term stands are required under drainage conditions unsuited to alfalfa. Production in seeding year is low but subsequent harvest should be good. Direct seedings are always preferred. Expect production for 10 years or more from well-managed stands. Free from danger of bloat. (2) Use in renovating low producing, rough or untillable pastures. By applying trefoil, fertilizer and herbicides transform these fields into more productive grassland in a period of two years. Details of the systems are given on page 22

Mixture Number	Components	Seed Rate	Use Recommendation
28	Trefoil Timothy	8 2	(Three or more years.) For long-term stands on fields not suited to regular rotations. Use Viking for early and Empire for late hay. This mixture is suitable also for use on acid soils. Trefoil hay must be harvested with care in order to reduce loss of leaf. Use Empire for long-term beef or sheep pasture. Free from danger of bloat.

Ladino-Based Mixtures

MANAGEMENT

1. Where protein feed is sought, harvest and ensile before blooms appear.
2. Restrict grazing in autumn to leave protective cover of leaves and grasses on overwintering creeping stems of ladino.
3. Controlled grazing management helps the stand remain productive for a period of years.

RECOMMENDATIONS

Mixture Number	Components	Seed Rate	Use Recommendation
STORED FEED			
47	Ladino	4	(For one year.) For protein production on fertile, moist soils. Makes excellent silage. Ladino has the highest content of protein among the legume forages. Four cuttings should be harvested, beginning at the end of May. Ladino is difficult to cure for hay.
PASTURE			
31	Ladino Orchard	2 8	Often productive for 5 to 8 years. Use where ladino is adapted. Ladino and orchardgrass grow best when moisture and winterkilling are not problems. High fertility and good management required for top production. Mixture 10 is preferred for drier fields.

Red-Clover-Based Mixtures

MANAGEMENT

1. Harvest for stored food at early bloom if top quality feed or a seed crop is expected from aftermath.
2. Provide nitrogen fertility for the grass in the second and subsequent years to maintain production after the legume dies out.

RECOMMENDATION

Mixture Number	Components	Seed Rate	Use Recommendation
STORED FEED			
7	Red Clover Alsike Timothy	6 2 6	(One year.) For fields where hay is the main consideration. Little clover can be expected in the second year. If mixture maintained, fertilize with nitrogen for second and subsequent harvest years.

Mixture Number	Components	Seed Rate	Use Recommendation
45	Red Clover Timothy	6 6	(One year.) For short-term stands of hay. If maintained more than one crop year, use nitrogen in order to maintain production. Recognize the resulting high cost of hay.

Pure Grass Stands

MANAGEMENT

1. Provide adequate nitrogen fertility to maintain production.
2. Harvest the grass in "head-emerging" stage for stored feed.

RECOMMENDATION

Components	Seed Rate	Use Recommendation
Reed canary or Bromegrass or Timothy or Orchard	8 10 8 8	Use for long-term stands where acid soils, wet soils and climatic conditions reduce persistence and production of legumes. High levels of nitrogen plus adequate phosphorus and potash are required for good production of pure grass stands.

Description of Recommended Forage Varieties

Buy Certified seed. Only then are you assured of getting the variety you pay for, or benefiting from the special attributes of the variety.

Tests in alfalfa, orchardgrass, and timothy show that when you buy "common" you get crops which look and perform differently than the variety you want. They are usually lower in yield. They are different in maturity. They are different in height and in winterhardiness. You can't depend on "common" seed to give the kind of plants you need to grow good crops consistently.

Your first choice always should be Certified seed.

There is sufficient Certified seed of recommended varieties to fill the needs of Ontario farmers in 1968 for all species except bromegrass. If you are unable to purchase Certified seed of bromegrass, your second choice should be "Canadian Brome". This is common brome seed produced in Western Canada. The crop produced from it is lower-yielding than the recommended varieties and so this seed should be your second choice only.

Canadian brome is recommended over common brome seed labelled "of United States origin", because the latter seed usually is of inferior quality. It is difficult to seed.

ALFALFA

STANDARD-TYPE alfalfa varieties, **VERNAL** and **NARRAGANSETT,** are winter-hardy and persistent. Stands of these varieties can be expected to remain productive up to four years, and perhaps longer. Where bacterial wilt is a problem, **VERNAL** is recommended. Bacterial wilt is a soil-borne disease which causes stands to thin out in the second and subsequent harvest years.

In fields free of bacterial wilt, **VERNAL** and **NARRAGANSETT** are equal in performance. Seed of both varieties is in adequate supply for 1968.

FLEMISH-TYPE alfalfa should make up a part of the alfalfa acreage on most Ontario farms. This type of alfalfa is earlier in maturity and produces more aftermath than the standard type. By growing both types, the farmer is better able to harvest all his alfalfa acreage at the right stage (first flower). Flemish-type alfalfa may be shorter lived than the standard type. For stands which are to be left down for two years only, any one of the recommended varieties is suitable. For stands to be left down for three years, the variety **SARANAC** should be used. Seed of all Flemish varieties is in adequate supply for 1968. Flemish varieties recommended for Ontario are compared in the following table.

VARIETY	WINTER-HARDINESS*	PERSISTENCE*	BACTERIAL WILT RESISTANCE	YIELD
Alfa	Very good	Good	None	Good
DuPuits	Good	Good	None	Good
Glacier	Very good	Very good	None	Good
Mega	Good	Good	None	Good
Saranac	Very good	Very good	Excellent	Good

*By way of comparison, Vernal would be rated as excellent for both winterhardiness and persistence.

BIRDSFOOT TREFOIL

Birdsfoot trefoil performs well as a long-term legume for pasture. Trefoil has never caused bloat.

EMPIRE is the most reliable variety for use under all conditions. It is recommended for long-term pasture and long-term hay fields. Empire stands have survived as long as 20 years in Ontario. Winterkilling of Empire is rare. It is suited to all crop regions and is the only variety recommended where surface water or winterkilling is a problem. It is the only variety recommended for use in Northern Ontario. Seed is in adequate supply.

VIKING has a more upright growth, starts growth earlier, blooms about two weeks earlier, and produces more aftermath than Empire. Because it is more subject to winterkilling than Empire and will not withstand poor drainage conditions, it is more limited in the area where it may be useful in Ontario. Viking is recommended for use in mixtures on soils where water is not a problem. Seed is in adequate supply.

LADINO CLOVER (White Clover)

MERIT Ladino clover is the result of an Iowa selection program emphasizing yield, winterhardiness, and tolerance to summer drought. In tests across Ontario it has outyielded, on the average, all other Ladino strains. When moisture is plentiful and temperatures are normal, it recovers more rapidly after defoliation than common white clover. It is at least as hardy as Certified Ladino imported from the United States and is recommended for use wherever Ladino is used in Ontario. There is a good supply of seed for 1968.

RED CLOVER

DOLLARD and **LAKELAND.** These two varieties are very similar in yield, maturity and persistence. They are more persistent in the second year of production than Canadian double-cut. They are recommended where stands will remain down for two years. Seed is in short supply for 1968.

CANADIAN DOUBLE CUT red clover is commercial seed produced in Canada. For one year stands, it is equal in yield to Dollard and Lakeland. Canadian double cut is superior to imported seed of British or U.S. origin.

For those farmers who wish to use a single-cut or late red clover, the variety **ALTASWEDE** is recommended.

BROMEGRASS

Bromegrass is important for early and late cut hay. Harvested at the recommended "heads emerged" stage, it averages about 69% in digestible energy. It is capable of maintaining a high feed value and at the early seed stage its digestibility is still 60%, while timothy and orchardgrass have declined to 53% or below. Furthermore, brome produces better aftermath than timothy and combines very well in alfalfa mixtures.

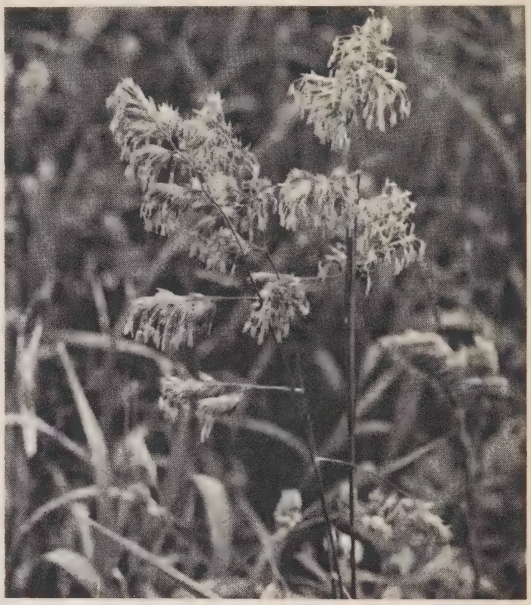
For early pasture bromegrass is superior to any of the other forage crops presently grown. Used in mixtures it permits early grazing in the spring and good growth during the summer, but can be faulted for lack of growth in the fall. As a general hay and pasture crop, however, bromegrass is a very important Ontario forage.

Clipped brome seed will be available from some sources again this spring. It is seed which has been trimmed mechanically to remove part of the hull and allow it to feed through the seeder better than unclipped seed. It flows better, is easier to sow, and gives a more uniform distribution than is usually the case with bromegrass seed.

REDPATCH and **SARATOGA.** These two varieties have good seed quality, high seedling vigor, early spring growth, and sometimes superior aftermath. They are recommended above all other varieties for all brome plantings. Seed of Saratoga is in moderate supply for 1968 while seed of Redpatch is very limited. Therefore, it is suggested that the available seed be used in pasture mixtures where the greater vigor and better distribution of production can be capitalized on. Both varieties are strong competitors and are the only good brome varieties that will compete satisfactorily with Flemish type varieties of alfalfa. In pasture mixtures or with Flemish type alfalfa, orchardgrass is an acceptable alternative to these varieties.

LINCOLN. This variety is less vigorous than Redpatch or Saratoga, but higher in yield than Canadian brome. Seed is in short supply for 1968.

ORCHARDGRASS



Feed value of grass declines as it grows older in the season. Orchard grass at the bloom stage (above) has lost 10% of its feed value. Orchard grass cut just after the head emerges from the leaf sheath has highest feed value per acre.

Orchardgrass is an early maturing forage that grows and matures very well with the Flemish alfalfa varieties or Ladino clover. Cut for stored feed just as it heads, it has averaged over 70% in digestible energy at Guelph which is superior to comparable stages of timothy and bromegrass.

Orchardgrass grows back immediately after cutting or grazing. It is our best grass for aftermath production and is capable of counteracting the bloating effect of alfalfa and the clovers. In well-managed pasture and hay pasture mixtures, orchardgrass makes very palatable feed of superior quality. Its fast growth and good production, however, must be fully utilized. It is an excellent grass for the good grassland man.

FRODE and **TARDUS II.** These two Swedish varieties are equal in performance. They are higher in yield and more leafy than most seed lots of common. There is an adequate seed supply of both varieties for 1968.

RIDEAU. This variety is 5 to 10 days later in maturing and leafier than Frode and Tardus II. It is slightly lower in yield. Seed supplies are short for 1968.

TIMOTHY

This forage grass has long been the basic meadow grass in Ontario. Timothy grows under a wider range of environments than any other grass used and is easy to establish and maintain. Cut at the heading stage, timothy is our highest yielding June hay crop and averages about 65% in digestibility. Like all grasses, however, it contains about half the crude protein content found in alfalfa. For pasture or in hay aftermath, timothy is a poor producer. Palatable and high yielding in the spring, it grows back slowly after cutting or grazing and produces relatively poor growth during the dry midsummer. However, timothy adds stand insurance and consequently small to moderate amounts are useful when making new seedings.

CLIMAX is slightly later and leafier than common timothy. Seed is in good supply for 1968.

REED CANARY GRASS

Although reed canary grass is adapted to dry upland soils it is used only on land subject to prolonged periods of flooding. Slow to establish, stands thicken after the first year and generally resist weed invasion. The very tall coarse growth obtained from reed canary is best utilized for stored feed in the form of silage or haylage. As dry hay, it lacks in palatability unless cut no later than early heading. It produces good aftermath yields.

For pasture reed canary grass is low in palatability. Cattle accept it quite readily, however, if it is well fertilized. Although it is a good pasture producer on wet land, it should not be used if the land will grow birdsfoot trefoil.

There are no superior varieties of reed canary grass available.

MEADOW FESCUE

Meadow fescue is no longer recommended as a component in forage mixtures. Trials conducted in Ontario have shown that timothy, bromegrass, orchardgrass produce higher yields and more leafy forage. However, for those farmers who wish to use meadow fescue, the variety **MIMER** is suggested. This variety is higher-yielding than common. Seed is in good supply for 1968.

Fertilizers for Hay and Pasture Crops

Differences in soil type and fertility, in grazing management and in the proportion of the legume in the forage stand are important considerations in the choice of analysis and rate of fertilizer. Forage crops have the capacity to produce high yields of total digestible nutrients (T.D.N.) per acre. Productive forage crops require large amounts of available plant food and are responsive to fertilizers containing phosphorus and potassium where the level of these nutrients in the soil is inadequate.

Legumes, with the possible exception of birdsfoot trefoil, generally are not tolerant of acid soil conditions. Acid soils (pH 6.0 or lower) should be limed one year before seeding, at rates indicated by soil tests.

Where legumes are to be sown in a field in which the particular legume has not been grown in the last three years, the seed should be inoculated.

Spreading manure on snow may cause an ice pack to form under the manure and smother the legumes (alfalfa, trefoil, red clover, ladino).

Fertilizer needs for hay and pasture crops should be determined from a soil test. The fertilizer rates suggested from soil tests are designed to produce highest economic yields when accompanied by good or above average management. The following general fertilizer recommendations should be followed only when a soil test report is not available.

FERTILIZING IN THE SEEDING YEAR

Seeded With a Companion Crop (oats, barley, mixed grain) OR Direct-Seeded Without a Companion Crop

► Where no manure is applied, use 15 lbs N, 60 lbs P_2O_5 and 60 lbs K_2O per acre, e.g. 5-20-20 (a 1-4-4 ratio) at 300 pounds per acre on sandy or loamy soils, or on clay soils use 15 lbs N, 60 lbs P_2O_5 and 30 lbs K_2O per acre, e.g. 5-20-10 (a 1-4-2 ratio) at 300 pounds per acre. When seeded with a companion crop where lodging may be a problem, use 300 pounds of 0-20-20 per acre (a 0-1-1 ratio) on all soils.

► Where manure is applied, use only 40 lbs P_2O_5 and 40 lbs. K_2O per acre, e.g. 0-20-20 (a 0-1-1 ratio) at 200 pounds per acre on sandy or loamy soils, or on clay soils use only 40 lbs P_2O_5 and 20 lbs K_2O per acre, e.g. 0-20-10 (a 0-2-1 ratio) at 200 pounds per acre.

Fall Topdressing Newly Established Seedings

Use 40 lbs P_2O_5 and 120 lbs K_2O per acre, e.g. 0-10-30 (a 0-1-3 ratio) at 400 pounds per acre on sandy or loamy soils, or on clay soils 40 lbs P_2O_5 and 20 lbs K_2O per acre, e.g. 0-20-10 (a 0-2-1 ratio) at 200 pounds per acre, in addition to the fertilizer applied at seeding time.

FERTILIZING ESTABLISHED STANDS

Broadcast fertilizer application is recommended.

Potash is best applied in August or early September to maintain the stand. Potash is particularly important on sandy or loamy soils. Phosphate may be applied in the spring, summer, or fall.

Nitrogen should be applied in the early spring. If more than 50 pounds of total nitrogen (N) per acre is required, a portion (up to 50 lbs of N per acre) should be applied in late August or early September.

When the levels of these nutrients in the soil are inadequate, fertilizer additions of phosphorus and potassium

applied to a legume sod in a rotation increase the forage yield, and often result in higher yields of the succeeding crop.

Legumes—Half or More of Stand (6 or more plants per square foot)

► Where no manure is applied, use 40 lbs P_2O_5 and 120 lbs K_2O per acre, e.g. 0-10-30 (a 0-1-3 ratio) at 400 pounds per acre on sandy or loamy soils, or on clay soils use 40 lbs P_2O_5 and 20 lbs K_2O per acre, e.g. 0-20-10 (a 0-2-1 ratio) at 200 pounds per acre.

► Where manure is applied, use only 20 lbs P_2O_5 and 60 lbs K_2O per acre, e.g. 0-10-30 (a 0-1-3 ratio) at 200 pounds per acre on sandy or loamy soils. On clay soils use 20 lbs. P_2O_5 per acre, e.g. 0-20-0 at 100 pounds per acre, preferably at the time of manure application.

Legumes—One-third to One-half of Stand (3 to 5 plants per square foot)

► Where no manure is applied, use 40 lbs P_2O_5 and 120 lbs. K_2O per acre, e.g. 0-10-30 (a 0-1-3 ratio) at 400 pounds per acre on sandy or loamy soils, or on clay soils use 40 lbs P_2O_5 and 20 lbs K_2O per acre, e.g. 0-20-10 (a 0-2-1 ratio) at 200 pounds per acre **plus 30 lbs N per acre, e.g. ammonium nitrate at 100 pounds per acre in the early spring on all soils. The phosphate and potash should be applied in late summer or fall.**

► Where manure is applied, use only 20 lbs P_2O_5 and 60 lbs K_2O per acre, e.g. 0-10-30 (a 0-1-3 ratio) at 200 pounds per acre on sandy or loamy soils. On clay soils use 20 lbs. P_2O_5 per acre, e.g. 0-20-0 at 100 pounds per acre, preferably at the time of manure application.

Grass Hay or Grass Pasture — Less than One-quarter Legume (2 or less plants per square foot)

It rarely pays to fertilize old bluegrass pastures.

It is profitable to fertilize grass stands consisting of productive grasses such as brome, orchard, or timothy. However, it is usually more profitable to reseed grass stands to a suitable legume rather than to fertilize them.

► Where no manure is applied, use 40 lbs P_2O_5 and 120 lbs K_2O per acre, e.g. 0-10-30 (a 0-1-3 ratio) at 400 pounds per acre on sandy or loamy soils, or on clay soils use 40 lbs P_2O_5 and 20 lbs K_2O per acre, e.g. 0-20-10 (a 0-2-1 ratio) at 200 pounds per acre **plus 120 lbs N per acre, e.g. ammonium nitrate at 375 pounds per acre on all soils. Apply 50 pounds of the total nitrogen (N) required in late August or early September.**

► Where manure is applied, use only 20 lbs P_2O_5 and 60 lbs K_2O per acre, e.g. 0-10-30 (a 0-1-3 ratio) at 200 lbs per acre on sandy or loamy soils. On clay soils use only 20 lbs. P_2O_5 per acre, e.g. 0-20-0 at 100 pounds per acre, preferably at the time of manure application.

Disease and Insect Control in Forage Crops

Maintain a close watch for **ARMYWORM** outbreaks in grasses in late June and July. If they become destructive, control them as indicated on page 32 under "Grain Crops".

The **CLOVER SEED MIDGE** can be a problem in those areas where Canadian double-cut red clover seed is produced. Early cutting of the first crop of red clover should be practiced for control. In Eastern Ontario, cutting of the first crop should be completed by June 15th for maximum control; in counties farther west, a day or so earlier.

Many other insects and some diseases occur in pasture and hay fields. Seldom is any one serious enough to warrant a control program. If a problem does develop, contact your Agricultural Representative or either of the Departments of Botany or Zoology at the Ontario Agricultural College, University of Guelph, Guelph, Ontario.

Annual Crops for Forage in Southern Ontario

SPRING PASTURE

AUTUMN-SEEDED FALL RYE, seeded at 2½ bu per acre, can be grazed for a short period in the spring, preferably after the stems start to form. Keep stock off when wet. Another pasture or green-chop crop (e.g. corn) may follow the rye in intensive programs.

SUMMER GREEN CHOP or PASTURE

CORN. Seeded early in May. Use hybrid seed or grain from the crib so long as germination is satisfactory. Seeding rate of 60 lbs per acre is adequate. No aftermath expected. If harvested after reaching 36-inch height, controlled grazing (e.g. fresh daily) makes most efficient use of crop when pastured.

OATS. Seeded any time in season at 2½ bu per acre to produce pasture in eight weeks. Graze when stems are forming. No aftermath can be expected.

SUDAN-SORGHUM HYBRIDS or HYBRID SUDAN GRASSES. Seeded in mid-May to early June at 12 lbs per acre. Harvest early August. Seven- or fourteen-inch row seedings suitable. Do not graze before growth 24 inches high or during periods of stress on plants, e.g. drought or cool weather, as prussic acid poisoning could occur. If frozen, graze only after a couple of days following the last frost. High aftermath yield possible only in hot, moist conditions or after very early first harvest.

Sudan-Sorghum Hybrids and Hybrid Sudan Grasses

Sudan-Sorghum Hybrids

Dekalb SX-5
Dekalb SX-11
Excel Chowmaker
Grazer A
Greenlan
Haapala SS-15
Haygrazer
Jacques J-Sue
Lindsey 77F
N.K. Sordan
PAG Suchow 34
Pioneer 985
Pride Su-ghum 60
R. P. Morsu
Su-x

Sudan Hybrids

N.K. Trudan 2
Royal

AUTUMN PASTURE

OATS. Seeded at 2½ bu per acre before August 15, ready for grazing by October 1st.

RAPE. Seeded by July 12 at 1½ lbs per acre in 28-inch rows. Pasture in late October. Makes good hog or beef pasture. Taints milk.

FALL RYE. Seeded by August 1 at 2½ bu. per acre gives good fall pasture.

SILAGE CROPS

Any of the annual forages can be made into silage. The immature crop commonly has lower quality and lower yield than the almost mature crop. Corn is the most important silage crop.

Varieties of English Broadleaf rape are more vigorous growing, compete better with weeds and outyield the old common types.

Pasture Renovation Using Trefoil and Herbicides

Introduction of trefoil to roughland or essentially "natural" grasslands has been shown to increase production by four or five thousand pounds per acre. Trefoil grows well on deep soils, is drought resistant, does not cause bloat and will persist for years. It will give production within two years when established well and fertilized adequately under the renovation schemes described below.

Thus renovation of roughland pastures has become practical with the development of techniques to fertilize, control weeds and establish productive crop plants without normal tillage.

Renovation using chemicals for sod and weed control and trefoil as the productive plant is restricted to those sites having at least 4″ of soil. The techniques described here are the best available today but should not be considered as replacements for standard seeding techniques where land can be worked in the normal way.

Renovation consists of a three-stage program. Each stage is of equal importance in ensuring successful development of a birdsfoot trefoil pasture.

Airplane seeding provides alternatives for applying herbicide, seed and fertilizer in pasture renovation. Broadcast seeders and spraying equipment do satisfactory jobs wherever the terrain is suitable.

1. PREPARATION OF THE SITE

The area to be renovated should be grazed during the summer, preceding fall, or spring renovation. Heavy grazing removes top growth and weakens grass sod, making the grass more susceptible to a grass herbicide. Grazing animals also help to remove heavy 'mats' of dead plant material characteristic of areas not grazed for several years. Removal of top growth and the 'mat' is essential if trefoil seeds are to reach the soil surface and establish successfully.

Heavy infestations of established perennial weeds such as blueweed, chicory, goldenrod, milkweed and thistle should be removed in preparation for renovation. The kinds and number of weeds present at each site will determine the specific herbicide treatment needed. Usually 16 to 18 oz of 2, 4-D or 14 to 16 oz of 2, 4-D + 2, 4, 5-T in late May or early September will suffice to remove many weeds found in pastures. Specific recommendations for weed control are given in Ontario Department of Agriculture and Food Publication 75, Guide to Chemical Weed Control.

2. RENOVATION OF THE SITE

Herbicides kill the natural grass sod in preparation for seedling establishment. Here the herbicide, fertilizers and seed have been applied and the trefoil is becoming established. In the seeding year additional weed growth can be expected and will require control measures.

The renovation program is aimed at removing the natural grasses, broadcasting birdsfoot trefoil on the soil surface and applying adequate fertilizer to ensure crop establishment.

Any one of three systems may be used. They are described in order of preference.

SYSTEM A. In mid-April, apply a mixture of:
45 lbs of 12.5% granular dalapon per acre,
10 lbs Empire trefoil, per acre,
100 lbs 0-46-0 fertilizer per acre.

The granular dalapon can be mixed with the trefoil seed and fertilizer. The mixture is applied **two to three weeks prior to the beginning of grass growth.** Components should be mixed **just before application.** Application can be made with any type of hand or power-operated broadcasting equipment.

Successful establishment of trefoil on natural pastures results in greatly increased production. Yearly fertilization is essential to continued production. Renovation using herbicides, birdsfoot trefoil and suitable fertilization has doubled the grazing capacity on a number of Ontario farms.

SYSTEM B. In September apply: 10 lbs of 74% soluble dalapon in 20 to 30 gallons of water per acre when grass is 2 to 3 inches tall, and in March following apply a mixture of seed and fertilizer on the frozen ground. The mixture should contain:
10 lbs Empire trefoil per acre
100 lbs 0-46-0 fertilizer per acre

SYSTEM C. In mid-April apply a mixture of:
10 lbs Empire trefoil per acre
100 lbs 0-46-0 fertilizer per acre,
and in mid-May apply:

½ gallon of paraquat (gramoxone) in 20 to 30 gallons of water per acre when the grass is about 2 inches tall and before the trefoil has germinated.

Regardless of the system used, it is important that the trefoil seed be inoculated with a fresh, live source of birdsfoot trefoil inoculant just prior to seeding. Best results have been obtained by using the 'wet' method of inoculation. Seed is thoroughly but not excessively dampened with a syrup mixture (one tablespoon of syrup or molasses in one quart of water). The dry inoculant powder is spread over the dampened seed and mixed thoroughly.

Dates indicated in the above outline of systems are intended for guidance only. Climatic conditions across the province are not uniform and the grass growth should be the determining factor for time of renovation. Applications should be as close as possible to the suggested dates, particularly for spring treatments. Delays will reduce the chances of successful establishment.

3. SEEDING YEAR MANAGEMENT OF THE RENOVATED SITE

Phosphorus and potash should be applied in late August or early September at rates based on a soil analysis. Because of low fertility in pasture areas fertilizer rates of 400 to 500 pounds of 0-20-20 per acre are not excessive.

Do not use nitrogen fertilizer.

During the seeding year some weed control will be necessary to remove broadleaf weeds establishing in areas made bare by grass herbicides. Grazing is often the most feasible and effective method of weed control. Such species as black medick, wild carrot and quackgrass are controlled in this way while less palatable weeds are controlled by trampling.

Never graze dairy cattle on dalapon-treated areas. Beef cattle can be permitted to pasture three weeks following dalapon application but should be removed 30 days before slaughter. There are no restrictions on grazing beef and dairy cattle on paraquat-treated areas.

Clipping will provide some weed control if animals are not available for grazing or cannot be used because of herbicide residuals but rough terrain will often prevent the practice.

2, 4-DB at 16 to 18 oz per acre applied in August or September will control some weed species but may retard trefoil growth.

Control methods will not kill all weeds and the renovated area will generally look untidy during the seeding year. Good establishment and adequate fertilizer will allow trefoil to dominate and crowd out many weeds in the second and subsequent years.

Heavily wilted hay crop silages keep well in horizontal silos for summer or winter feeding only when volume is high enough to give a 12' or more depth of silage and a fast feed rate.

The move to silage from hay transforms whole farming operations. Success requires extensive planning to take advantage of the features built into the silage system. Improved mechanization into and out of storage represents the major contribution for silages. Reduction of harvest and storage losses represents a sizable contribution of the silage package to hay crop harvest and preservation. A further feature for hay crop silage centers on the reduced field curing time and improved quality compared with field cured hay.

Harvest at first flower stage of alfalfa is recommended for preservation as wilted silage. Haylage of this kind contains up to 20% crude protein on a dry matter basis. It is more than enough to provide all the protein requirements of dairy cows and beef at medium to high production levels.

Vertical silos perform superbly for storing silages wilted to 60 to 50% moisture. Care is essential in making sure the moisture percentage remains over 40% moisture to prevent heating and over 45% to reduce "gumming" in the blower and pipes. In summer or winter cattle relish high dry matter silages made from "early cut" legume-grass hay crops.

Least total losses in field and storage, coupled with feed value equal to the best and lack of disagreeable smell encourage Ontario farmers in a move toward the wilted silage (haylage) system for preserving the hay crop as silage. Wilting to the desirable range of 50 to 60% moisture frequently takes one day after cutting, conditioning and windrowing.

GRAIN CROPS

Grain crops deserve to be treated as first-rate crops whenever they are included in a cropping program. They must compete for their place in that program by producing high yields economically. To produce high yields requires that all parts of the grain production package be considered. No one factor can support high yields without the others. No one factor can be neglected without a corresponding decrease in yields.

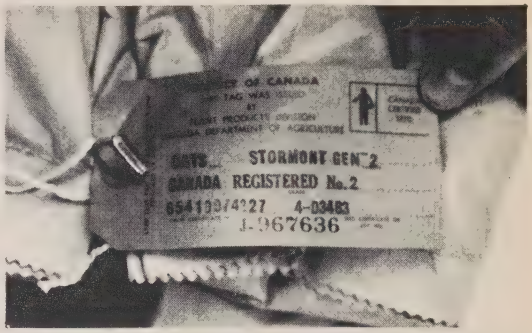
Improved varieties express their full potential only when they are used in combination with proper seeding times, seeding depth, and recommended seeding rates as well as adequate fertility applications. Indeed they perform well only when diseases, insects, and weeds are eliminated as production hazards.

Integrating the production practices into a package becomes the problem of the farmer. On his ability to do this rests the final yield and outcome of his grain production program.

1968 Grain Variety Recommendations

(See Heat Unit Map on page 6)

Variety recommendations are general guides for choosing a variety. Descriptive tables accompanying recommendations show characteristics for each variety which may limit its use. Because no variety is perfect, the recommendations should be coupled with experience and information from the description to choose a variety for your use.



This Canada Certified Seed Tag represents pure, quality seed, and assures you of the variety you ask for. Look for it on the seed you buy. Cost per acre is more than repaid by these factors. Certified seed pays best in pure stands of crops such as oats and barley. Have you arranged for your 1968 needs of Cereal Seed? Certified is the quality to use in producing commercial crops. Ask for it by variety name.

Spring Grains

All spring grains respond with higher yields to early seeding. Plant as early as soil conditions permit. The target date for the Guelph area should be April 15.

BARLEY

Recommendations

Feed Varieties

YORK —All areas

KEYSTONE —All areas where mildew is not a problem.

HERTA —All areas where more than 2,300 heat units are available.

CHAMPLAIN —Counties east of Frontenac.

Malting Varieties

PARKLAND, **CONQUEST** —All areas if malting quality is required.

	Yield	Type and Maturity	Height	Lodging Resistance	Reaction to Disease*	
					Loose Smut	Mildew
YORK (6-row)	High	Smooth-awned, midseason	Medium	Medium to good	VS	R
KEYSTONE (6-row)	Medium to high	Smooth-awned, midseason	Medium	Good	R	S
HERTA (2-row)	Medium to high	Rough-awned, a week later than York	Medium to short	Medium to good	T	R
CHAMPLAIN (6-row)	High	Smooth-awned, 3 to 5 days later than York	Medium to tall	Medium to weak	T	S
PARKLAND (6-row)	Medium to high	Smooth-awned, mid-season	Medium	Medium to good	S	S
CONQUEST (6-row)	Medium to high	Smooth-awned, mid-season	Medium	Medium to good	R	S

*See also Disease and Insect Control Recommendations, page 31, particularly loose smut control.

R = resistant; T = tolerant; S = susceptible; VS = very susceptible

Variety recommendations for grains to be stored and used as high moisture grains and whole plant silages are the same as those to be used for normal grain storage and use.

Barley continues to respond to good management. One result is further expansion of acreage to provide feed yields second to no other spring cereal crop in Ontario.

OATS

Recommendations

GARRY
RUSSELL —All areas
KELSEY

DORVAL —Counties east of Frontenac and North of 2300 heat unit line.

STORMONT —Farms where lodging is a problem.

	Yield	Height	Lodging Resistance	Maturity	Reaction to Disease*		
					Septoria	Smut	Rust
GARRY	High	Medium to tall	Medium to good	Midseason week later than York barley	S	R	MR
RUSSELL	High	Medium	Medium to good	Midseason	T	R	MR
KELSEY	High	Medium	Medium	Midseason	—	R	MR
DORVAL	High	Medium to tall	Medium	3 to 5 days later than Garry	S	S	S
STORMONT	Medium	short	good	2 to 4 days earlier than Garry	T	R	MR

* See also Disease and Insect Control Recommendations, page 31, particularly nematodes.

R = resistant; S = susceptible; T = tolerant; MR = moderately resistant

Testing programs throughout Ontario provide a sound basis for recommendation of new varieties. Direct comparison of actual performance of new varieties with standard varieties sorts out superior types for farm use.

WHEAT

Recommendations	
SELKIRK **MANITOU**	For those farmers who choose to grow any spring wheat. Generally spring wheat in Ontario is much lower-yielding than winter wheat where the latter can be grown successfully.

SELKIRK — Awnless, white chaff, red grain. Resistant to stem rust, bunt, and loose smut. Susceptible to mildew and leaf rust. Good lodging resistance.

MANITOU — Similar to Selkirk but resistant to leaf rust.

FLAX

Recommendations	
MARINE **NORALTA** **REDWING**	—All areas

	Maturity	Flower	Seed	Reaction to Disease*		
				Wilt	Pasmo	Rust
MARINE	Early	Small, blue	Small	R	MR	S
NORALTA	Early	Small to medium, blue	Small	R	T	R
REDWING	Early	Light blue	Small	MR	S	S

* See Disease Control Recommendations, page 31

R = resistant; S = susceptible; T = tolerant; MR = moderately resistant.

Winter Grains

For good winter survival, seed early enough to obtain adequate top growth and root development in the autumn. This is particularly important for winter barley.

WINTER WHEAT

Recommendations	
GENESEE **TALBOT**	—Areas south of the 2300-heat-unit line.
RICHMOND	—Counties east of Frontenac.
RIDEAU (Feed only)	—Counties east of Frontenac and favored areas having less than 2300 heat units.

	Yield	Lodging Resistance	Winter Survival	Reaction to Disease*	
				Loose Smut	Rust
GENESEE	High	Medium	Medium	MR	S
TALBOT	High	Medium to good	Medium	MR	S
RICHMOND	Medium	Medium	Medium	S	S
RIDEAU	Medium	Poor to medium	Good	S	S

* See Disease and Insect Control Recommendations, page 31, particularly Fusarium Head Blight.

MR = moderately resistant; S = susceptible; MS = moderately susceptible.

WINTER BARLEY

Recommendations	
DOVER	—Areas south of the 2700-heat-unit line where winter barley can be expected to survive. Winter barley is not as winter-hardy as winter wheat.

DOVER — Strong, short-strawed, high yield, good threshability. Very early maturity. Six-rowed and rough-awned. Susceptible to loose smut, resistant to mildew.

WINTER RYE

Recommendations	
TETRA PETKUS	—For areas with more than 2300-heat-unit ratings. Tetra Petkus should not be grown in close proximity to common rye as the two cross to give sterility and lowered yields.
IMPERIAL	—For areas between the 2300- and 1900-heat-unit lines.

IMPERIAL — Winter-hardy, weak-strawed variety of common rye with light-colored kernels. Pedigreed seed supplies limited.

TETRA-PETKUS — A tetraploid variety with strong straw and large kernels. Ontario tests show this variety to be a high-yielding grain or green-manure crop. It is more winter-hardy than winter wheat but less winter-hardy than Imperial.

Fertilizers for Grain Crops (not seeded down)

(See page 19 for Grain Crops Seeded Down)

Fertilizer for cereal crops should be applied in the drill row with a combination fertilizer drill, or with a fertilizer attachment on the drill.

Fertilizer needs of grain crops should be determined from a soil test. The fertilizer rates suggested from soil tests are designed to produce highest economic yields when accompanied by good or above average management. The following general fertilizer recommendations should be followed only when a soil test report is not available.

Manure, if available, should be used for crops such as corn and forage that give greater response to manure than grain crops.

Where manure is applied (10 or more tons per acre), the amount of fertilizer recommended for spring barley and flax **should be reduced by one-half.**

SPRING BARLEY

► Where no manure is applied, or where the crop follows a crop of less than ¼ legume, apply 30 lbs N, 30 lbs P_2O_5 and 30 lbs K_2O per acre, e.g. 10-10-10 (a 1-1-1 ratio) at 300 lbs per acre on sandy, loamy or clay soil.

► If the preceding crop contains ¼ to ½ legumes, apply approximately 8 lbs N, 30 lbs P_2O_5 and 30 lbs K_2O per acre, e.g. 5-20-20 (a 1-4-4 ratio) at 150 pounds per acre.

► If the preceding crop contains more than ½ legumes, apply 30 lbs P_2O_5 and 30 lbs K_2O per acre, e.g. 0-20-20 (a 0-1-1 ratio) at 150 pounds per acre.

OATS, MIXED GRAIN

► Where no manure is applied, use 20 lbs N, 20 lbs P_2O_5 and 20 lbs K_2O per acre, e.g. 10-10-10 (a 1-1-1 ratio) at 200 pounds per acre on sandy, loamy or clay soils.

► Where the grain crop follows a legume sod, or where lodging of the grain may be a problem, use only 20 lbs P_2O_5 and 20 lbs K_2O per acre, e.g. 0-20-20 (a 0-1-1 ratio) at 100 pounds per acre on sandy or loamy soils, or on clay soils use only 20 lbs P_2O_5 per acre, e.g. 0-20-0 (a 0-1-0 ratio) at 100 pounds per acre.

FLAX

Use 10 lbs N, 40 lbs P_2O_5 and 40 lbs K_2O per acre, e.g. 5-20-20 (a 1-4-4 ratio) at 200 lbs per acre on sandy or loamy soils, or on clay soils use 10 lbs N, 40 lbs P_2O_5 and 20 lbs K_2O per acre, e.g. 5-20-10 (a 1-4-2 ratio) at 200

pounds per acre. Where no manure is applied or where the crop does not follow a legume sod, an additional 30 lbs N per acre, e.g. ammonium nitrate at 100 pounds per acre should be applied broadcast or drilled in before planting.

► Where more than 200 pounds of fertilizer per acre is placed in contact with the flax seed, fertilizer injury may result.

WINTER WHEAT, WINTER BARLEY, RYE

► Where no manure is applied, use 15 lbs N, 60 lbs P_2O_5 and 60 lbs K_2O per acre, e.g. 5-20-20 (a 1-4-4 ratio) at 300 pounds per acre on sandy or loamy soils, or on clay soils use 15 lbs N, 60 lbs P_2O_5 and 30 lbs K_2O per acre, e.g. 5-20-10 (a 1-4-2 ratio) at 300 pounds per acre. Where the crop does not follow a legume sod, apply 40 lbs N per acre, e.g. ammonium nitrate at 120 lbs per acre as a top-dressing in the early spring before growth begins. If nitrogen cannot be applied in early spring, apply 60 lbs N per acre in the late fall prior to freeze-up, e.g. ammonium nitrate at 180 lbs per acre. The larger amount is required as fall applications are less effective than spring applications.

► Where lodging of grain may be a problem or where the fall-sown grain follows a legume sod, use 60 lbs P_2O_5 and 60 lbs of K_2O per acre e.g. 0-20-20 (a 0-1-1 ratio) at 300 pounds per acre on sandy or loamy soils, or on clay soils use 60 lbs P_2O_5 and 30 lbs K_2O per acre, e.g. 0-20-10 (a 0-2-1 ratio) at 300 pounds per acre.

► Where manure is applied, use 30 lbs P_2O_5 and 30 lbs K_2O per acre, e.g. 0-20-20 (a 0-1-1 ratio) at 150 pounds per acre on sandy or loamy soils, or on clay soils use 30 lbs P_2O_5 and 15 lbs K_2O per acre, e.g. 0-20-10 (a 0-2-1 ratio) at 150 pounds per acre.

Disease and Insect Control in Grain Crops

(See also pages 40 to 41)

CROP ROTATION AND SANITATION

► **OAT NEMATODES.** If oat nematodes have caused damage, do not plant oats following spring grains. Use legume or row crops in the rotation. Corn may be used in the rotation when the nematode population is low but it will suffer damage if the soil is heavily infested. The nematode invades but does not reproduce in corn roots. Consequently, successive cropping to corn effectively reduces the nematode population.

► **FUSARIUM HEAD BLIGHT (Scab), CERCOSPORELLA FOOT ROT** and **TAKE ALL** in wheat are a constant threat. To prevent outbreaks causing serious damage, do not grow wheat after wheat, barley, or corn. Careful covering of crop residues helps control these diseases.

PREPLANTING TREATMENT OF SOIL

WHITE GRUBS. Damage may occur in any year. Treat soil before planting if grubs are seen during cultivation when old grass sod has been plowed up for grain or in areas where beetles were plentiful in 1967.

Spray (amounts on a per-acre basis) with one of the following:

chlordane emulsible concentrate (8 lbs per gal), 1 gal
chlordane 50% wettable powder, 16 lbs

Immediately after the application to the soil surface, cultivate to a depth of 2 to 4 inches.

Granular chlordane 25%, 32 lbs

May be drilled directly into the soil or may be applied and then cultivated in. These rates will also control **CUTWORM** and **WIREWORM.** However, see seed treatment below for a more economical control when wireworm is the only insect to be considered.

SEED TREATMENT*

► All cereal seed should be treated with a mercurial or Metiram (Polyram — non-mercurial) seed dressing to control the diseases listed below. Follow manufacturer's directions carefully.

In Barley
COVERED SMUT
SEEDLING BLIGHT

In Wheat
COMMON BUNT
FUSARIUM BLIGHT
SEEDLING BLIGHT

In Oats
COVERED SMUT
LOOSE SMUT

In Flax
SEEDLING BLIGHT

In Rye
SEEDLING BLIGHT

COMMON BUNT in wheat can be controlled also by treating with chlorobenzene seed dressing. This is less hazardous to apply under farm conditions. Consult page 40 about the dangers and precautions to follow when preparing and using mercurial and other seed treatments.

► **WIREWORMS** damage cereal crops in certain areas every year. Injury is usually most severe in the two years following grass sod. As a precautionary measure, treat all grain seed with one of; 50% aldrin, or 50% dieldrin, or 50% heptachlor, or 50% lindane wettable powder, at one ounce per bushel in combination with an organic mercurial or non-mercurial fungicide according to directions on the label. Add the correct amount of fungicide and insecticide to one-half pint of water for each bushel to be treated. When treating, pour the water in slowly while mixing and do a thorough job of wetting all of the seed. Commercial seed-treatment gives thorough coverage, but mixing can also be done in a cement mixer or by thorough hand shovelling. The dry powder can be mixed with the seed but this may result in inadequate coverage.

Consult page 40 about the dangers and precautions to follow when preparing and using mercurial and other seed treatments.

LOOSE SMUT IN BARLEY AND WHEAT — Use resistant varieties or pedigreed seed of susceptible varieties because they have a low smut count by embryo test.

* *See Ontario Department of Agriculture and Food Publication 252, Chemicals for Seed Treatment of Small Grains, for trade names of chemicals, and Publication 524, Common Grain Smuts and Their Control, for details of treatment.*

Apply the anaerobic treatment to reduce loose smut infestation in a few bushels of seed for the following year.

Directions for an anaerobic treatment: soak the seed in water for two hours at approximately 76°F. After soaking, drain off water and place seed in a closed container (milk can or plastic bag) for 65 hours at 76 to 80°F. It is essential that these temperature limits be observed. After treatment, spread out the seed in a thin layer to dry enough to run through a drill. Treated seed can be kept for several weeks, provided it is dried thoroughly.

FOLIAGE TREATMENT AND POISON BAIT

► To control **ARMYWORMS,** use at time of outbreak either a poison bait or a spray application. If spray application is preferred, treat with **ONE** of the following insecticides at the indicated rate per acre:

carbaryl (Sevin)
- 50% wettable powder, 2 lbs
- 80 or 85% wettable powder, 1¼ lbs

malathion
- 25% wettable powder, 6 lbs
- 50% emulsible concentrate (5 lbs per gal), 1¼ quarts

methoxychlor
- 50% wettable powder, 3 lbs
- 24% emulsible concentrate, 2½ quarts

parathion
- 15% wettable powder, 2 lbs

If you propose to spray an in-bloom forage crop, first read the warning about bees on page 40

POISON BAIT — Add carbaryl (Sevin) 50% wettable powder, 2 lbs OR the 80% or 85% wettable powder of the same insecticides, 1¼ lbs to 2 gal water and thoroughly mix with 25 lbs of bran until the mixture crumbles. Broadcast evenly in late afternoon at the rate of 25 lbs of dry bran per acre.

CONTROL OF ALTERNATE HOSTS FOR RUST DISEASE

STEM RUST AND OAT LEAF RUST. Rust losses run to millions of dollars annually. Presence of these diseases means that there may be common barberry or European buckthorn in your area. To reduce loss from rust and prevent production of new rust races capable of attacking rust-resistant varieties of oats, barley, and wheat, destroy all common barberry and European buckthorn shrubs. Particularly bad infestations of rust should be reported to the Agricultural Representative or to the County Weed Inspector. Then a check of the surrounding area can be made to uncover and "rout out" any barberry and buckthorn. A complete description of these bushes is found in Ontario Department of Agriculture and Food Publication 49.

PEAS AND FIELD BEANS

(See Heat Unit Map on page 6)

Field Pea Varieties

Recommendations

CENTURY
CHANCELLOR —Areas north of the 2900-heat-unit line.

CHANCELLOR — Small, smooth, yellow peas of good quality for soup or protein supplement for feeding. Flowers white, matures midseason.

CENTURY — Seed medium size, smooth and rounded, yellow, used for soup either whole or split. Flower white, matures midseason (same as Chancellor).

Field Bean Varieties

Recommendations

Choose a variety that will mature every year in your location.

SANILAC —Late planting in areas having more than 3100 heat units. Early planting in areas having 2700 to 3100 heat units.

SEAWAY —Late planting in areas having more than 2900 heat units. Early planting in areas having 2700 to 2900 heat units.

STEUBEN —Early planting in areas having more than 3100 heat units.

	Plant Type	Maturity	Seed Type	Reaction to Disease	
				Mosiac	Anthracnose
SANILAC	Bush	Medium	Small, white	MR	R
SEAWAY	Bush	Early	Small, white	R	S
STEUBEN	Bush	Very late	Yellow eye	S	S

S = susceptible; R = resistant; M R = moderately resistant.

Fertilizers for Field Peas and Beans

Fertilizer needs of the pea and bean crops should be determined from a soil test. The following general fertilizer recommendations should be followed only when a soil test report is not available.

► On sandy or loamy soils use 15 lbs N, 60 lbs P_2O_5, 60 lbs K_2O per acre, e.g. 5-20-20 (a 1-4-4 ratio) at 300 pounds per acre.

► On clay soils use 15 lbs N, 60 lbs P_2O_5, 30 lbs K_2O per acre, e.g. 5-20-10 (a 1-4-2 ratio) at 300 pounds per acre.

► Where manure is applied or where the beans are grown after a legume sod, omit the nitrogen and use, at the same

rates, 0-20-20 (a 0-1-1 ratio) on sandy and loamy soils and 0-20-10 (a 0-2-1 ratio) on clay soils.

► Follow application methods recommended for Soybeans.

► **Field beans** produce highest yields following a legume sod which has been manured.

Special care should be taken to avoid contact between the seed and the fertilizer when planting because pea and bean seedlings are easily damaged by direct contact with fertilizer, especially if the soil is dry.

► Manganese deficiency occurs frequently in field beans. Refer to soybeans for information concerning this condition.

Disease and Insect Control in Field Beans

(See also pages 40 to 41)

CROP ROTATION AND SANITATION

► **ANTHRACNOSE** and **BACTERIAL BLIGHT** are persistent diseases against which a continual fight must be waged. To keep them from building up, follow a 3- to 5-year rotation; do not apply manure containing bean refuse to land intended for beans; do not plant seed which has been harvested from diseased plants; and stay out of fields when foliage is wet.

WHITE MOLD (Sclerotinia) usually occurs after August 15 in fields where dew never completely evaporates from plants. This is caused by poor air circulation. Where the disease is a problem, use bush type varieties and reduced seeding rates (never more than 5 to 6 seeds per planted foot). The fungus is widespread and crop rotation may not give much control.

SEED TREATMENT

► Seed treatments containing diazinon, lindane, and a fungicide are required to protect large-seed crops from **SEED MAGGOTS, WIREWORMS** and **SEED-DECAY ORGANISMS.**

APPLICATION OF THE INSECTICIDES ALONE MAY RESULT IN REDUCED GERMINATION. Diazinon is used to control seed maggots; lindane to control wireworms. The combination seed treatment should be applied every year because maggots are usually an annual pest and the kill of the wireworm seldom is high.

Most seed planted in Ontario is grown in Michigan and is certified. Dealers here treat most of it with the combination treatment (slurry techniques). However, there are growers who purchase either untreated or partially treated (fungicide only) seed. These use a planting box formulation and dry-treat the seed immediately before planting. The following remarks are addressed to these latter growers: directions stated on the container should be followed with care; the mixing in the planting box must be thorough or germination will be reduced and insect control will be poor; for your protection while mixing, use rubber gloves or a wooden paddle and avoid breathing dust stirred up while the mixing is in progress.

SOIL AND/OR FOLIAGE TREATMENT

► **MEXICAN BEAN BEETLES** seldom require control except perhaps in one area. Where experience has shown this to be necessary, spray the plants when damage is observed and appears to be general. Soil treatment before planting is seldom warranted under our conditions. Amounts given are for one acre.

Spray

with **one** of:

(1) carbaryl (Sevin) 50% wettable powder, 1 lb
(2) carbaryl (Sevin) 80 or 85% wettable powder, ¾ lb
(3) endosulfan (Thiodan) 4E emulsible concentrate, 1 pint
(4) dimethoate (Cygon 4E, Rogor 40), ½ to ¾ pint

Granular Treatment

phorate (Thimet) 10% granular, 10 lbs
OR
disulfoton* (Di-Syston) 10% granular, 10 lbs

Apply below and to the side of the seed — never in contact with it.

► **POTATO LEAFHOPPERS** cause severe damage in some years. As protection, growers of white beans are advised to apply controls every year. Two or at most three treatments will be adequate. Apply a **spray** at 10-day intervals beginning about mid-June. Cover both upper and lower surfaces of leaves. Any **ONE** of the following insecticides is recommended and the amounts stated are for one acre:

carbaryl (Sevin)
50% wettable powder, 2 lbs
80 or 85% wettable powder, 1⅓ lbs
DDT
50% wettable powder, 2 lbs
malathion
25% wettable powder, 4 lbs
endosulfan (Thiodan)
4E emulsible concentrate, 1 pint
disulfoton* (Di-Syston)
liquid concentrate, 1 pint
dimethoate (Cygon 4E, Rogor 40)
½ to ¾ pint

Granular Treatment

disulfoton* (Di-Syston 10%, 10 lbs
phorate (Thimet) 10% granular, 10 lbs

If DDT, endosulfan or dimethoate is used do not use the stover for either feed or bedding.

► **GREEN CLOVERWORM** appears some years as green worms (loopers) feeding on bean foliage, causing holes in leaves and reducing yield. If more than 5 or 6 caterpillars are found per foot of row, spray with carbaryl (Sevin) 50% wettable powder at 2 pounds per acre OR Sevin 80 or 85% wettable powder at 1¼ pounds per acre. Shake worms from plants onto paper to count them.

* *Not within 60 days of harvest; 30-inch row spacing; as side-dressing after plants establish or at planting time, band on each side of seed furrow.*

SOYBEANS

Ontario Needs More Soybeans

For every bushel of soybeans produced in Ontario, two bushels of U.S. soybeans are imported every year. Canada's trade deficit in soybeans for 1967 may exceed $40 million. The need for soybeans is well established. The land and technology are available to produce those beans economically in Ontario.

Ontario's average soybean yield has been consistently higher than Corn Belt State averages. Ontario's 32.3 bushels per acre in 1966 was highest in North America. Excellent fields of soybeans like this produce a high return per dollar invested.

Soybean Varieties

(See Heat Unit Map on page 6)

Variety Recommendations

Start early to look for 1968 seed. Most varieties will be in short supply.

Choose a variety that will mature every year in your locality.

When you intend to sow fall wheat following a soybean crop, choose a variety that requires 300 heat units less than those available in your area.

Variety	Heat Units Required	Recommended Row Width
ALTONA	2500	14″ or less
MERIT	2600	21″ or less
HARDOME	2700	21″ or less
CHIPPEWA 64	2800	24″ or less
HAROSOY 63	3100	28″ or less

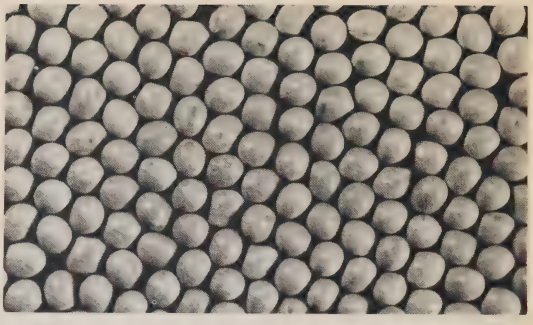
Planting Recommendations

Plant soybeans in rows narrow enough that plants will fill the inter-row area. Suggested row spacings are given above along with recommendations for individual varieties. Soybeans seldom yield near their potential when seeded in rows over 28 inches wide.

In 28-inch rows drop one seed per inch in the row. About 60 pounds of seed per acre will be required. Make allowance for variety seed size differences. Increase the seeding rate 15 pounds per acre for every 7 inches the rows are narrowed from 28 inches. Use care and take time in seeding. You can count on losing at least 10% of the stand under any situation and more when seeding is uneven. The result is less than maximum yields. Uniform depth of seeding at 1 to 1½ inches is important.

Inoculation

Inoculation of soybean seed with commercial inoculum is highly recommended. Successful inoculation results in the formation of nodules on the roots. Nodules allow the plant to use nitrogen from the air and are essential for high returns. Inoculation is particularly important when soybeans are being established on a field for the first time. Follow all the directions on the container of inoculant.



Evenly graded seed of pedigreed grades represents the foundation of uniform stands and a productive soybean crop.

Variety Descriptions

	Seeds per Pound	Color			Reaction to Phytophthora Root Rot
		Flower	Pubescence	Hilum	
ALTONA	2400	Purple	Brown	Black	R
MERIT	3000	White	Gray	Buff	R
HARDOME	2700	Purple	Gray	Gray	S
CHIPPEWA 64	2900	Purple	Brown	Black	R
HAROSOY 63	2600	Purple	Gray	Yellow	R

S = susceptible; R = resistant.

Altona is a new variety for 1968. It is very early, exceptionally tall for its maturity and has excellent yield potential.

Soybean yields suffer greatly from weed competition. Perennial weeds must be under control before soybeans are planted. Control of perennial weeds can be accomplished using Atrazine in corn crops preceding soybeans. If you do not grow corn, control perennial weeds with late summer tillage and a non-specific systemic herbicide such as Amitrol-T.

For very narrow rows

When 14-inch or 7-inch rows are used, effective weed control must be obtained with herbicides. The preplant incorporated Treflan plus pre-emergence linuron treatment has demonstrated excellent control of both broadleaf and grassy annual weeds and is recommended for these row widths. The treatment is relatively expensive but the expense is justified. See Publication 75, 1968 Guide to Chemical Weed Control, for details and other weed control measures.

Fertilizers for Soybeans

Soybeans will produce highest yields where other crops in the rotation have been well fertilized. Bean seedlings are easily damaged by direct contact with fertilizer. Soybeans should be inoculated each time the crop is planted.

Fertilizer needs of the soybean crop should be determined from a soil test. The following general fertilizer recommendations should be followed only when a soil test report is not available.

► On sandy or loamy soils use 10 lbs N, 40 lbs P_2O_5, 40 lbs K_2O per acre, e.g. 5-20-20 (a 1-4-4 ratio) at 200 lbs per acre.

► On clay soils use 10 lbs N, 40 lbs P_2O_5, 20 lbs K_2O per acre, e.g. 5-20-10 (a 1-4-2 ratio) at 200 lbs per acre.

► A planter with a separate shoe for fertilizer placement may be used to place the fertilizer two inches to the side and two inches below the level of the seeds, or the fertilizer may be plowed down or worked in before planting.

► **MANGANESE DEFICIENCY** occurs frequently in soybeans. The upper leaves range from pale green (slight deficiency) to almost white (severe deficiency) while the veins remain green.

Correct the deficiency as soon as detected, by spraying with 6 to 8 pounds of manganese sulfate in 20 or more gallons of water per acre. Use a "spreader sticker" (such as Tween 20) in the spray. If the deficiency is severe, a second spray may be beneficial.

Never use spray equipment which has been used for spraying hormone-type herbicides such as 2,4-D. Beans are very sensitive to these types of herbicides.

Disease and Insect Control in Soybeans

(See also pages 40 to 41)

SEED TREATMENT

► See Seed Treatment under Field Beans on page 34 When planting soybeans in an area for the first time, omit the seed treatment. Seed treatment chemicals may be too toxic for the inoculant and poor inoculation can result. Poor inoculation cannot be accepted where high yields are being sought.

PLANTING

► On clay soils where **PHYTOPHTHORA ROOT ROT** is a problem, and a suitable resistant variety is not available, deep seedbed preparation will minimize losses due to this disease.

FOLIAGE TREATMENT

Green Cloverworms appear some years as green worms (loopers) feeding on soybean foliage, causing holes in leaves and reducing yield. For control, see under Field Beans, page 34

SUGAR BEETS

Fertilizers for Sugar Beets

Rotations that include a well-manured legume crop are desirable. The best time to grow sugar beets is in the second year following legume and/or manure applications. Fertilizers do not take the place of organic matter obtained from legumes and manure, but their combined use gives increased yields.

Fertilizer needs of the sugar beet crop should be determined from a soil test. The following general fertilizer recommendations should be followed only when a soil test report is not available.

► On sandy or loamy soils use 90 lbs N, 160 lbs P_2O_5, 160 lbs K_2O per acre e.g. 5-20-20 (a 1-4-4 ratio) at 800 pounds per acre plus 50 lbs N as a separate application.

► On clay soils use 90 lbs N, 160 lbs P_2O_5, 80 lbs K_2O per acre e.g. 5-20-10 (a 1-3-2 ratio) at 800 pounds per acre plus 50 lbs N as a separate application.

► If the soil is well manured (approximately 15 tons per acre) or if the beet crop follows a good legume sod, the additional nitrogen may not be required. Following a well-manured legume sod the actual rate of application of the complete fertilizer may be reduced to 600 pounds per acre.

Methods of Fertilizer Application

► The ideal placement of fertilizer is two inches deeper than the seed, and either under the seed or about two inches to one side.

Where the drill does not separate the fertilizer and the seed, then not more than 300 pounds of fertilizer per acre should be applied in contact with the seed; the remainder should be broadcast and worked in before planting.

► Where the additional 50 pounds of nitrogen is necessary, apply it as a preplanting application or as a side-dressing before July 1st. If nitrogen is applied after the first of July it may reduce the sugar content.

► Minor Elements—In the case of recurring deficiencies of minor elements, such as boron and manganese, consult your local Agricultural Representative or the District fieldman for the sugar beet company.

When boron deficiency is observed on sugar beets, spray application of boron is most effective. Apply 12 lbs of finely ground borax with 3 lbs of bentonite clay and 2 to 2½ cups or orthex (sticker) in 40 gallons of water per acre when roots are 1 to 1½ inches in diameter. Borax may also be applied as a dust (when foliage is dry) at the rate of 40 lbs per acre.

GENERAL INFORMATION FOR CROP PRODUCTION

Fertilization

Ontario currently uses more than 650,000 tons of commercial fertilizers annually, and the trend of usage moves steadily upward. Although they are essential, and an integral part of efficient crop production, they do not eliminate the need for good soil management to maintain soil organic matter, tilth, aeration and drainage.

Organic matter is the natural source of nitrogen and the storehouse of mineral nutrients, but usually it cannot supply all the nitrogen and minerals that crops can use to advantage. Therefore, commercial fertilizers must be used where soil tests and crop growth indicate that more plant food is needed for optimum production.

Commercial fertilizer is of most value where the level of organic matter is satisfactory. Some mineral soils, however, may be well supplied naturally with mineral elements, but because of a lack of organic matter plants may not make effective use of them.

Fertilizers with an increased content of nutrients are available. Because there are more plant nutrients per ton in these fertilizers and fewer freight and handling charges, the cost is usually less for each pound of plant food.

Soils are often grouped into sandy (coarse-textured) soils and clay (fine-textured) soils for purposes of fertilizer recommendations. Generally more nitrogen and potassium fertilizer is needed to maintain high levels of fertility in a sandy soil than in a clay.

Fertilizer Materials

Nitrogen fertilizer materials are available in dry, liquid, and gaseous forms. Which of these forms to use is a matter of choice for the individual farmer depending upon availability of the material, equipment for handling, and cost per pound of nitrogen plus the cost of application.

A farmer should first calculate the cost per pound of nitrogen from various sources delivered to his farm. Depending on the rate of application, the cost per acre can be determined. Add to this the cost of application per acre before deciding on the nitrogen source to use.

Where separate additions of nitrogen are referred to in the recommendations, pounds of elemental nitrogen, not pounds of materials, are used. The following tables show the percentage of fertilizer nutrient contained in different materials.

NITROGEN MATERIALS
PERCENTAGE OF NITROGEN (N)

	(pounds of N per 100 lbs of material)
Solids	
Ammonium Sulfate	20
Calcium Cyanamid	21
Ammonium Nitrate	33.5
Urea	45
Nitrogen Solutions	
Aqua Ammonia	20
Ammonium Nitrate-Urea	28 and 32
Ammonium Nitrate-Ammonia	38 and 41
Gas	
Anhydrous Ammonia	82

PHOSPHATE MATERIALS
PERCENTAGE OF PHOSPHATE (P_2O_5)

	(pounds of P_2O_5 per 100 lbs of material)
Superphosphate	20
Treble Superphosphate	46
Ammonium Phosphate	11-48-0*
Diammonium Phosphate	18-46-0*

The potassium fertilizer materials most commonly used are muriate of potash, sulfate of potash, or sulfate of potash-magnesia (up to 19% MgO).

POTASH MATERIALS
PERCENTAGE OF POTASH (K_2O)

	(pounds of K_2O per 100 lbs of material)
Muriate of Potash	60
Sulfate of Potash	48
Sulfate of Potash-Magnesia	22

Soil Management and Fertilizer Use

The basis for a sound soil fertility program on Ontario farms is the soil test.

Every effort should be made by the farmer to sample the soil from his fields at regular intervals (every two to three years) in order to maintain or increase his production and to obtain information on the most profitable use of commercial fertilizers.

* *These materials also contain 11 pounds of N or 18 pounds of N per 100 lbs of material.*

Soil samples from fields to be fertilized for spring crops should be taken the previous fall.

Soil samples from fields to be fertilized for fall wheat or from hay and pasture fields to be fertilized in the fall should be taken in the spring or early summer.

Mail or express samples to the Department of Soil Science, Ontario Agricultural College, University of Guelph, Guelph, Ontario, where the soil analysis will be completed.

Fertilizer recommendations based on soil test results are made by Agricultural Representatives, Fruit and Vegetable Specialists, and Soils and Crop Specialists, in County and District offices. Soil sample boxes and field information sheets are available from these offices. Management practices which affect a soil test recommendation are: manure application, straw or cornstalks plowed down, the kind of crop to be plowed down, and the crop to be fertilized. **This information is important and should be recorded on the field information sheet which must accompany the soil sample sent in for analysis, before reliable fertilizer recommendations can be made.**

The soil test can:
(1) indicate the kind and amount of lime required;
(2) measure the soil nutrients available for crop production;
(3) provide the basis for suggested rates of fertilizer application.

Fertilizers applied on the basis of soil test results do not remove the limitations placed on crop production by poor soil drainage, by adverse weather conditions such as moisture and temperature, by inadequate plant populations or poor choice of variety, by poor weed control programs, or by insect damage.

The general recommendations for fertilizer applications, which appear in this publication, are intended only as a guide when soil tests are not available. Specific fertilizer needs of a soil may be determined more accurately by a soil test. Growers are strongly advised to take advantage of this service to obtain information on the most profitable use of commercial fertilizers.

Alternative Methods of Supplying Fertilizer Requirements

The general recommendations for nitrogen, phosphate, and potash given for each crop can be applied using (1) mixed fertilizers or (2) mixed fertilizers and fertilizer materials or (3) fertilizer materials alone.

Below are examples of three possible ways of supplying the fertility requirements:

Suggested Alternative Methods of Supplying Fertilizer Required (lbs per acre)

Crop	Crop Requirements			Mixed Fertilizers (1)	Mixed Fertilizers And Materials (2)	Materials (3)
	N	P_2O_5	K_2O			
Corn	100	60	60	5-20-20 @ 300 lbs at planting 85 lbs N side-dress*	10-10-10 @ 200 lbs at planting 80 lbs N side-dress* 40 lbs P_2O_5 plus 40 lbs K_2O plowed down	11-48-0 @ 125 lbs at planting 85 lbs N side-dress* 60 lbs K_2O plowed down
	100	60	30	5-20-10 @ 300 lbs at planting 85 lbs N side-dress*		11-48-0 @ 125 lbs at planting 85 lbs N side-dress* 30 lbs K_2O plowed down
Hay-Pasture (mainly alfalfa)	0	40	80	0-12-24 @ 330 lbs broadcast in fall		40 lbs P_2O_5 plus 80 lbs K_2O broadcast in fall
Hay-Pasture (mainly grass)	120	40	80		0-12-24 @ 300 lbs plus 50 lbs N broadcast in fall 70 lbs N broadcast in spring	40 lbs P_2O_5 plus 80 lbs K_2O plus 50 lbs N broadcast in fall 70 lbs N broadcast in spring

* Nitrogen may be side-dressed, plowed down in the spring, or worked into the soil in the spring before planting corn.

Crop	Crop Requirements			Mixed Fertilizers (1)	Mixed Fertilizers And Materials (2)	Materials (3)
	N	P_2O_5	K_2O			
Cereal Crops	15	60	60	5-20-20 @ 300 lbs at planting		
	0	40	20	0-20-10 @ 200 lbs at planting		

Similar alternatives are possible for other crops not listed in the above examples.

Use of Pesticides

Different companies' brands of a pesticide often have different concentrations of the same chemical in them. Consequently, if you use one with a concentration different from that listed in the recommendations in this publication, you will need to adjust the rate of application so that you will be applying the same amount of actual chemical (active ingredient).

Calibrate your sprayer (page 41) at least twice during the growing season. The wear on nozzle and other parts will alter the amount of spray delivered at the usual rate of speed and pressure.

SAFETY OF OPERATOR

1. Read the safety precautions on the label before using any pesticide. Follow them. Understand the directions given before proceeding. If the label calls for the use of protective clothing or equipment, do not proceed without it.
2. When opening containers and filling the sprayer, avoid splashing or spilling. If it occurs, clean pesticide up promptly and burn any rags or papers used in soaking it up. Do not breathe the dust of dry pesticides. In case of a spill on the operator's person, remove clothing from affected area and wash at once.

3. Pesticides should be mixed or prepared in the open air or in a well-ventilated room. Measure the ingredients accurately and mix them thoroughly before applying. Refrain from smoking, eating, or drinking while mixing or applying pesticides.
4. Do not work in spray drift, dust, or fumes. Avoid downwind spraying.
5. Wash contaminated clothing before wearing it again.
6. After applying an insecticide, the operator should bathe and change into clean clothing.
7. Treat all pesticides (insecticides, herbicides, fungicides) as highly poisonous substances and handle them with great caution.
8. Excess pesticide solution should be poured out in an isolated area where it will not contaminate crops or water, or injure domestic animals or wildlife.

MERCURIAL SEED TREATMENTS

Seed dressings or treatments are poisonous to man and livestock. Do not inhale the fumes or dust when treating or handling treated seed. Wash all residues of these chemicals from the skin after seed treatment is completed. Never feed surplus seed treated with chemical seed dressings. Bags which have held mercury-treated seed must not be used for foodstuffs or feed. Non-mercurial products are available.

PROTECT HONEYBEES

Because bees may be killed, do not apply insecticides on "bee pastures" or on wild plants that are in bloom. Carbaryl (Sevin) is extremely toxic to honeybees and perhaps to other pollinators as well. If insect control is necessary while crops are in bloom and attractive to honeybees, spray only in the evening or early in the morning when bees are not in the field. Avoid applications by air or ground equipment when the wind will carry the insecticide to adjacent bee pastures.

IN CASE OF ACCIDENT INVOLVING A PESTICIDE

If a pesticide is swallowed or if a person suddenly feels sick while using a pesticide, call a physician immediately. So that he will know what poison may be involved, give the physician a label from the container or the common or chemical names of the ingredients listed on the label, together with the suggested antidote, if any, and first aid treatment. Keep the telephone number of your own physician by the telephone.

Information regarding first aid and advice on treatment in cases of pesticide poisoning is available from Dr. E. Mastromatteo, Environmental Health Branch, Ontario Department of Health, Parliament Buildings, Toronto 2, Ontario.

Telephone: area code 416; office 365-2493; home 485-9606.

PESTICIDE APPLICATION BY AIRPLANES OR HELICOPTERS

Applications should not be made if the wind is blowing. Some drift occurs even on the stillest day and to keep it to a minimum, apply pesticides in the evening or early morning. A special permit for aircraft application is required by the Ontario Department of Health, for most organo-phosphorus insecticides and for endrin, aldrin, and dieldrin. Malathion, dimethoate, and diazinon are exempt, however. Be sure that the product to be used is registered for application by aircraft and specified along with rate of application in the contract.

RESIDUES ON CROPS TO BE HARVESTED OR FED OR GRAZED

Certain pesticide residues disappear quickly after application; others persist in poisonous form for much longer periods. When crops with persistent residues are fed to livestock, the poisons tend to accumulate in the body fat and milking cows will secrete them, or their metabolic products, in the milk. Young calves, heifers, and dry cows will store these in body fat and secrete them when they freshen months later. Even the use of bedding from treated crop remnants is not recommended.

Never apply aldrin, dieldrin, endosulfan (Thiodan), chlordane, DDT, endrin, heptachlor, BHC or lindane to forage, hay, or other feed that is to be fed to livestock. If hay, corn stover, pea vines, bean straw, sugar beet tops, etc are purchased, check on the possibility of their having been sprayed. While DDT is recommended in Ontario Department of Agriculture and Food Publication 363, Ontario Vegetable Production Recommendations, for insect problems with sweet corn, neither the stalks nor the silage should be fed. Apple pomace should not be fed because there are residues of insecticides present that may appear later in the milk.

When using other pesticides, do not apply a treatment closer to pasturing, feeding, or harvest than the waiting period indicated below:

malthion — 7 days	carbaryl (Sevin) — 1 day
methoxychlor — 7 days	
parathion — 21 days	dimethoate (Cygon, Rogor) — 30 days

CONTAINER DISPOSAL

Empty pesticide containers usually contain harmful residues. Paper and cardboard containers should be burned (keep out of smoke) and the ashes buried under at least two feet of earth in an isolated place, where the residues cannot contaminate water supplies or crops, or injure domestic animals or wildlife. Metal or glass containers should be crushed or broken and buried as described above.

PESTICIDE STORAGE

Pesticides should be stored in their original containers with labels in place — **never in food or beverage containers.** They should be kept in a dry place (wall cupboard, etc) which is kept locked when the products are not being used. Never leave open packages or tins of pesticides around while you are spraying elsewhere.

Determining the Sprayer Output per Acre

(Sprayer Calibration)

Here is one method of calibration for both overall spraying and band spraying.

1. Set out two stakes 330 feet apart.
2. Pick a level spot and fill the sprayer tank with water. Operate the sprayer to be sure that the supply line up to the shut-off valve is full before finally filling the tank. RECORD THE WATER ON A MEASURING STICK.
3. Spray between stakes in both directions at a DEFINITE SPEED AND PUMP PRESSURE. Turn the boom on as the first stake is passed in each direction. The by-pass pressure relief valve must be set to give the desired pressure when the shut-off valve is open. MARK THE THROTTLE SETTING.
4. Return the sprayer to the same location as before the calibration run. Carefully measure the amount of water required to refill the tank to the same mark on the measuring stick.
5. Calculate the application rate in gallons per acre

$$\text{G.P.A.} = \frac{\text{Gallons of Water added} \times 66}{\text{Boom length (in feet)}}$$

Sample Calculation: (1) Overall Sprayer. If the sprayer has a 25-foot-long boom and 12 gallons of water are required to refill the tank, the application rate is:

$$\text{G.P.A.} = \frac{12 \times 66}{25} = 31.7 \text{ gallons per acre.}$$

Sample Calculation: (2) Band Spraying. If the sprayer has four nozzles and each nozzle covers a 14-inch band, the total width of the spray patterns (boom length) is:

$$4 \times \frac{14}{12} \text{ feet or } 4.7 \text{ feet.}$$

If two gallons of water are required to refill the tank, the application rate is:

$$\text{G.P.A.} = \frac{2 \times 66}{4.7} = 28.1 \text{ gallons per acre.}$$

NOTE: When band spraying, the acreage actually sprayed is NOT the same as the crop acreage.

Weights, Measures and Seeding Rates

Liquid Measure

20 fluid oz = 1 pint
40 fluid oz = 2pints = 1 quart
160 fluid oz = 8 pints = 1 imperial gallon

Square Measure

144 sq ins = 1 sq ft
1,296 sq ins = 9 sq ft = 1 sq yd
39,204 sq ins = 272¼ sq ft = 30¼ sq yds = 1 sq rod
6,272,640 sq ins = 43,560 sq ft = 4,840 sq yds = 160 sq rods = 1 acre

SEEDING RATES AND WEIGHTS PER BUSHEL

Crop	Weight Lbs per Bushel	Rate of Seeding per Acre
Wheat	60	1½ bu
Oats	34	2 bu not seeded down; 1½ bu if seeded down
Barley	48	2 bu
Rye	56	Small-seeded variety 1½ bu; large-seeded 2½ bu
Buckwheat	48	1 bu
Corn	56	10 lbs
Beans	60	Small 35 lbs
Soybeans	60	45 to 70 lbs in rows
Peas	60	1½ to 3 bu
Flax	56	35 lbs for seed
Millet	48	20 lbs
Potatoes	60	25 bu
Turnips	50	½ lb
Mangels		5 lbs
Rape & Kale	50	1½ lbs in rows

Crop	Weight Lbs per Bushel	Number Seeds per Lb
Alfalfa	60	200,000
Red Clover	60	275,000
Ladino	60	800,000
White Dutch Clover	60	800,000
Birdsfoot Trefoil	60	375,000
Sweet Clover	60	260,000
Alsike	60	700,000
Timothy	48	1,230,000
Orchard Grass	14	654,000
Bromegrass	14	136,000
Meadow and Tall Fescue	22	230,000
Perennial Rye Grass	20	227,000
Reed Canary Grass	44	533,000
Bluegrass	18	2,177,000
Sudan Grass	40	55,000

ESTIMATING STORAGE CAPACITY OF FEED VOLUME

Small Grains

To calculate the approximate capacity of a bin in bushels from the measurements of the bin in feet:
Length X Width X Height X 0.8 = bu

Ear Corn in Crib

Length (ft) X Average Width X Average Depth X 0.4 = bu Shelled Corn.

Space Required to Store One Ton of Hay

	Cubic Feet per Ton
Loose in shallow mows	500 to 575
Loose in deep mows	400 to 450
Baled loose	250 to 300
Baled tight	150 to 200
Chopped long-cut or shredded	250 to 365
Chopped short-cut	250 to 300

Corn Silage* in Horizontal Silo

Width in Feet		Depth in Feet	Length in Feet	Tons Silage in Silo	Tons Silage per Running Foot in Silo
Top	Bottom				
8	6	6	22	16	.7
10	7	8	27	32	1.2
12	8	8	45	63	1.4
13	9	8	61	95	1.6
14	10	8	75	126	1.6
15	11	8	95	158	1.7
16	12	10	97	236	2.4
17	12	10	124	315	2.5

* These estimates are based on 1 cu ft of corn silage weighing 35 to 50 lbs. For grass silage, increase tonnage estimates by 15%.

Volume of Tower Silos at Various Sizes

Inside Diameter of Silo	Volume of Silo				
	Per Ft of Depth	Per 20 Ft of Depth	Per 40 Ft of Depth	Per 60 Ft of Depth	Per 80 Ft of Depth
(feet)	(cu ft)	(cu ft)	(cu ft)	(cu ft)	(cu ft)
10	78.5	1,570	3,140	.....	.....
12	113.1	2,262	4,524	6,786	.....
14	153.9	3,078	6,156	9,234	.....
16	201.0	4,020	8,040	12,060	.....
18	254.5	5,090	10,180	15,270	.....
20	314.2	6,284	12,578	18,852	.....
22	379.9	7,598	15,196	22,794	.....
24	452.2	9,044	18,088	27,132	.....
26	530.7	10,614	21,228	31,842	.....
28	615.4	12,308	24,616	36,924	.....
30	706.5	14,130	28,260	42,390	56,520

Approximate Silo Capacities — Whole Shelled Corn and Ground Ear Corn[1]

Moisture in Kernels (%)	Weight to Yield Standard Bushel [3] (Lbs)	Volume to Yield Standard Bushel [3] (Cu ft)	Silo Capacity Per Foot of Height (Bu) [3]						
			Inside Silo Diameter (ft)						
			12	14	16	18	20	24	30
Whole Shelled Corn[2]									
15.5	56.0	1.25	90	123	161	203	251	362	565
20.0	59.1	1.30	87	119	155	195	241	348	542
25.0	63.1	1.36	83	113	148	186	231	332	518
30.0	67.6	1.44	79	107	140	176	218	313	490
Ground Ear Corn									
15.5	70.0	1.94	58	80	104	131	162	233	363
20.0	76.5	2.05	55	75	98	124	153	220	343
25.0	84.4	2.18	52	71	92	116	144	207	323
30.0	92.1	2.30	49	67	87	110	137	196	307

(1) This table of silo capacities was calculated on the basis of data supplied by V. W. Davis, in Publication AE -3997, University of Illinois, March, 1964.

(2) For ground shelled corn, increase silo capacity per foot by 14%.

(3) Standard bushel = 1 bu shelled corn at 15.5% moisture. All amounts shown are equivalent to the standard bushel of shelled corn.

County and District offices of the

ONTARIO DEPARTMENT OF AGRICULTURE AND FOOD

County or District	Address	Telephone
ALGOMA	1496 Wellington St. E., Sault Ste Marie	253-1941
BRANT	207 Greenwich St., Brantford	759-4190
BRUCE	Box 300, Walkerton	881-3301
CARLETON	60 Larkspur Dr., Ottawa 6	828-2781
COCHRANE N.	Experimental Farm, Kapuskasing	335-5828
COCHRANE S.	Matheson	32
DUFFERIN	Box 100, Orangeville	941-3830
DUNDAS	Winchester, Box 488	744-2106
DURHAM	14 Frank St., Bowmanville	623-3348
ELGIN	594 Talbot St., St. Thomas	631-4700
ESSEX	Essex	776-7361
FRONTENAC	Box 651, Kingston	546-3697
GLENGARRY	Box 579, Alexandria	525-1046
GRENVILLE	Kemptville, Box 70	258-3411
GREY	Markdale	986-2790
HALDIMAND	Cayuga	772-3381
HALTON	181 Main St., Milton	878-9701
HASTINGS	Box 146, Stirling	395-3393
HURON	Box 159, Clinton	482-3428
KENORA	70 Van Horne Ave., Dryden	223-2415
KENT	61½ King St. W., Catham	354-2150
LAMBTON	Box 730, Petrolia	882-0180
LANARK	Box 460, Perth	267-1063
LEEDS	Box 635, Brockville	342-2124
LENNOX & ADD.	Box 1400, Napanee	354-4321
LINCOLN	Vineland Station	562-4142
MANITOULIN	Gore Bay	52
MIDDLESEX	209 County Bldg., King & Ridout Streets, London	434-7343
MUSKOKA & P. S.	Box 130, Huntsville	789-5491
NIPISSING	22 McIntyre St. W., North Bay	474-3050
NORFOLK	19 Kent St. S., Simcoe	426-0680
NORTHUMBERLAND	Box 218, Brighton	475-1630
ONTARIO	Box 309, Uxbridge	852-3132
OXFORD	Box 666, 954 Dundas St. E., Woodstock	537-6621
PEEL	3 Elizabeth St. S., Brampton	451-5560
PERTH	Box 398, 478 Huron St., Stratford	271-0280
PETERBOROUGH	164 Hunter St., Peterborough	745-6851
PRESCOTT	Plantagenet, Box 110	673-5111
PRINCE EDWARD	Box 470, Picton	476-3224
RAINY RIVER	Front St., Emo	482-2310
RENFREW	289 Raglan St. S., Renfrew	432-4841
RUSSELL	Rockland, Box 280	762-5106
SIMCOE N.	Box 159, Barrie	726-0236
SIMCOE S.	Box 370, Alliston	435-5521
STORMONT	Box 655, 109-11th St. W., Cornwall	933-1581
SUDBURY	172 Elm St. W., Sudbury	674-3151
TEMISKAMING	Box "G", New Liskeard	647-6701
THUNDER BAY	Box 958, 590 Memorial Ave., Port Arthur	345-1472
VICTORIA	322 Kent St. W., Lindsay	324-6121
WATERLOO	824 King St. W., Kitchener	744-5294
WELLAND	574 South Pelham St., Welland	732-7552
WELLINGTON	Box 370, Arthur	848-2447
WENTWORTH	1100 Main St. W., Hamilton	527-1744
YORK	Suite 211 & 212, Newmarket Shopping Plaza, Newmarket	895-4519

Soils and Crops Branch Specialists

Location	Address	Phone Number	Counties Served
W.O.A.S.	Ridgetown	519-674-5456	Essex, Kent, Lambton, Elgin, Middlesex
Soil Science Dept.	Univ. of Guelph	519-824-4120 X2454	Huron, Perth, Waterloo, Wentworth, Haldimand, Lincoln, Welland
Crop Science Dept.	Univ. of Guelph	519-824-4120 X2513	Wellington, Halton, Peel, York, North & South Simcoe
Research Station	Box 820, Delhi	519-582-1950	Oxford, Brant, Norfolk
Ontario Dept. of Agriculture & Food	Markdale	519-986-2790	Bruce, Grey, Dufferin
Ontario Dept. of Agriculture & Food	322 Kent St. W., Lindsay	705-324-6121	Ontario, Peterborough, Durham, Victoria
Ontario Dept. of Agriculture & Food	Box 531, Brighton	613-475-1630	Northumberland, Hastings, Lennox and Addington, Prince Edward
Ontario Government Bldg.	Box 279, Kemptville	613-258-3411	Renfrew, Frontenac Leeds, Lanark, Carleton Grenville, Dundas Russell, Prescott

Seeds and Weeds Specialists

Eastern Ontario	Ontario Department of Agriculture and Food, Box 218, Brighton	613-475-1630
Western Ontario	Crop Science Department, University of Guelph	519-824-4120 X2513

Insect and Disease Specialist

Zoology Department, University of Guelph	519-824-4120 X2147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ONTARIO

PROVINCE OF OPPORTUNITY

1968 FIELD CROP RECOMMENDATIONS

Compiled by:
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CROP SCIENCE DEPARTMENT
ONTARIO AGRICULTURAL COLLEGE
UNIVERSITY OF GUELPH
GUELPH, ONTARIO

Information supplied under the direction of Ontario Committee on Field Crop Recommendations, composed of representatives of the following organizations:

ONTARIO AGRICULTURAL COLLEGE,
UNIVERSITY OF GUELPH
ONTARIO DEPARTMENT OF AGRICULTURE
Extension Branch
Soils and Crops Branch
Kemptville Agricultural School
Western Ontario Agricultural School
New Liskeard Demonstration Farm
CANADA DEPARTMENT OF AGRICULTURE
Research Station, Ottawa
Research Station, Harrow
Experimental Farm, Fort William
Experimental Farm, Kapuskasing
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